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– – – – – – – – to provide information and to stimulate discussion. Not to be attributed as official FAS policy unless specifically so indicated.

VISAS FOR FOREIGN SCIENTISTS: REPORT ON AN FAS SURVEY *

The FAS Passport and Visa Committee, with support and endorsement by the FAS Council, sent questionnaires to all foreign scientists who were invited to international physics conferences in the U.S. in September, 1966. (13th High Energy Physics Conference, Berkeley, California; and Nuclear Physics, Gatlinburg, Tennessee). The questionnaires asked about dates of application and receipt of U.S. visas, and general comments were also solicited. Of about 400 questionnaires mailed, 133 returns were received. The statistical data are summarized in the table on page 2.

The Scandinavian countries, Switzerland, Germany, the English-speaking countries, and others seem relatively free of delays now, though several respondents questioned the need for visitors' visas at all when their countries have not required such of U.S. citizens for two decades. In Italy, France, and the Netherlands more scientists report delays, two from France receiving visas only the last day. No one reported failure to obtain a visa in time for a conference. A few reported questions by consuls regarding their political beliefs and this reflects a requirement of the McCarran-Walter act of 1952 for those persons whose organizational memberships or activities may place them in "anarchist-" or "Communist-" sympathizer categories (Sec. 212, Subsec. [28], Immigration and Naturalization Act.). These elaborate provisions on "subversives" were not altered by the new law in 1964 which eliminated the national origins quota system. The uniquely restrictive features of our laws governing visitors' visas are still unaltered from the fifties, when the peak occurred in abuses. These troubles were well documented by J. Campbell Bruce in his book *The Golden Door: The Irony of Our Immigration Policy* (Random House, New York; 1954). Also the complete October, 1952 issue of the *Bulletin of the Atomic Scientists* was devoted to the critical visa problems. Two years later in the March, 1954 issue, Weisskopf wrote: "By the fall of 1952, mounting public indignation, newspaper and magazine articles, and individual appeals to the State Department led to some improvements in the situation . . . The visa situation has generally deteriorated again. The time interval between application for and receipt or rejection of a visa has now ballooned to six to nine months or more. The questioning of applicants is becoming obnoxious again

(Continued on page 4, Col. 1)

Since this report was prepared a bill has been introduced in both Houses of Congress which could greatly reduce the visa difficulties of foreign scientists visiting the United States. The main effect of the bill would be to let citizens of selected countries travel to the U.S. without visas for periods of not more than 90 days. This waiver of visa requirements would presumably apply for those countries which do not require visas for U.S. citizens, which is the case now for all Western European countries. In addition to this reciprocity policy, visa requirements could also be waived for other countries if this were deemed to "promote the foreign policy of the United States." It is not clear, however, that the bill would completely eliminate various "political" questions and tests which have impeded the travel of foreign scientists to the U.S.—this would probably depend on the way in which the new law is applied by consular and other officials, if and when it is passed. The bill has the strong support of the Administration, and is in line with efforts to stimulate travel by foreigners to the U.S. to help reduce the balance-of-payments deficit. As this NEWLETTER goes to press, the bill (H.R. 15651) is awaiting hearings in the House Judiciary Committee. Developments relating to the new bill, and its implications for the international travel of scientists, will be reported in future NEWSLETTERS.—H.L.P.

INCREASING CAMPUS INTEREST IN SCIENCE AND SOCIETY

For the report which follows, the NEWSLETTER is indebted to FAS Treasurer Leonard S. Rodberg.

A growing number of colleges and universities are starting research and teaching programs dealing with the social consequences of science and technology. Whether these go under the title of Science and Public Policy, or under a broader title such as Science and Human Affairs, they represent important new departures in the organization of university affairs, as well as signalling a greater recognition of the importance of studying the implications of science for the modern world.

A number of political science departments, at such institutions as MIT and Indiana University, have begun programs in the governmental issues associated with the management of science. At Harvard and Columbia Universities, interdisciplinary programs have begun to explore areas such as education and industrial organization where science is currently having a major impact. At other institutions individual courses at the undergraduate level dealing with the policy issues raised by science (arms control, environmental pollution, the population explosion, computers, and so on) are being offered, and graduate seminars in this area are beginning in political science and sociology departments.

Recently two conferences dealing with science and society have been held, both arising from the initiative of Eugene Rabinowitch, founder and Editor-in-Chief of the Bulletin of Atomic Scientists. The first symposium, entitled Science and the Human Condition, was held last November at the University of Illinois, as part of that university's Centennial Year celebration. Its purpose was to examine how higher education should be altered to respond to the growth of technology, particularly emphasizing the social and political consequences of that development. Working groups considered ways of integrating science teaching with history, literature, philosophy, and the social sciences, and a number of suggestions for courses on science and public policy were advanced. Copies of the final report of this symposium may be obtained from Dr. Joel Alan Snow, Center for Advanced Study, University of Illinois, Urbana, Illinois.

The second conference was held during March to inaugurate a new Center for the Study of Science and the Future of Human Affairs at the State University of New

(Continued on Page 6, Col. 1)

FAS COUNCIL MEETING

The FAS Council will meet in Washington, D.C. at the Sheraton-Park Hotel on Tuesday evening, April 23rd, at 7:30 p.m. in the Baltimore Room and on Wednesday evening, April 24th, at the same time, in the Richmond Room.

There will be a public meeting Monday evening, April 22nd, at 8:30 p.m. sponsored by the APS (but organized with the help of FAS) titled "The University and the National Defense." Panelists will be John Wheeler, Richard Garwin, John Rasmussen, and William Davidon. Chairman will be Dale Corson.

STATISTICS ON TIME REQUIRED FOR VISA ISSUANCE FOR TWO PHYSICS CONFERENCES IN 1966

Country of Citizenship	Number of Cases					Delays by Individual Case	
	Total Responses	Didn't Apply for Visa	Already Had Valid Visa	Processed in less than 4 Days	Delayed Past 4 Days	Days Required for Processing	Days Before Departure to U.S. When Issued
Austria	4	0	2	1	1	21	14
Benelux	12	1	3	4	4	6	—
						30	90
						50	50
						11	29
Brazil	4	1	1	1	1	12	9
Bulgaria	1	0	0	0	1	26	4
Czechoslovakia	1	0	0	0	1	14	7
Denmark	1	0	0	1	0		
Finland	1	0	0	1	0		
France	14	0	3	5	6	60	30
						7	—
						60	½
						60	1
						75	9
						30	60
Germany	21	1	5	11	4	7	14
						20	20
						14	42
						10	20
India	3	0	1	2	0		
Israel	1	0	1	0	0		
Italy	11	0	2	7	2	14	—
						30	60
Japan	6	0	0	4	2	6	6
						35	21
Mexico	1	1	0	0	0		
Norway	1	0	0	0	1	7	14
Poland	2	0	0	0	2	42	3*
						45	14
Rumania	1	0	0	0	1	210	25
Spain	1	0	0	0	1	20	10
Sweden	12	0	3	8	1	5	—
Switzerland	4	0	1	3	0		
Union of South Africa	2	0	0	1	1	20	10
United Kingdom and Australia	27	0	7	15	5	30	—
						7	—
						14	42
						21	21
						13	19
Viet Nam (So.)	1	0	0	0	1	7	—
Yugoslavia	1	0	0	0	1	49	7
TOTALS	133	4	29	64	36		

* Visa issued in Montreal after departure from Poland.

STUDY SHOWS LIMITED DATA ON LONG-TERM EFFECTS OF DEFOLIATION ON ECOSYSTEMS

A National Academy of Sciences review of a report prepared by the Midwest Research Institute on the ecological effect of defoliants such as those being used in Vietnam has found that the Institute did a creditable job in surveying the available literature. But it emphasized that little quantitative data exist on the most important question at issue—the truly long-term effect of the herbicides on ecosystems. The NAS review of the MRI report was requested last fall by the Defense Department at the suggestion of the AAAS. The report was to be primarily an assessment and evaluation of the scientific literature relating to herbicides and ecological effects.

The Division of Biology and Agriculture of the National Research Council selected a small group of scientists experienced with the use of herbicides to perform the review. The 369-page MRI report and the Academy's review of it were made public by the Defense Department on February 7th. (*News Report*, National Academy of Sciences; March 1968. See also *Science*, 9 February 1968, and the *New York Times*, 13 February 1968. The report of the Midwest Research Institute is available from the Government Printing Office.)

NEWS ITEMS

The U.S. rate of scientific growth is such that Europe will probably drop further behind, concludes the most ambitious assessment of American science policy ever undertaken by foreign experts. The 701-page report was prepared by the Organization for Economic Cooperation and Development (OECD), with representatives of 21 nations, mostly in Europe. Among the conclusions of the report: American science probably benefits from the lack of a central policy which tightly controls its directions; this "pluralistic" leadership is likely to continue even though it leads to some duplication, some second-rate research, and a tendency of technological development to drift away from long-term national goals; competition for funds, prestige, and quick results have stimulated American scientific productivity but made it for some a "rat race"; leaving relatively little room for "contemplative" thought and bold departures in theory; an American advantage is the freedom with which specialists move back and forth between industry, government, and universities—in the words of one European, "with us, the university is still an ivory tower"; European industrial leaders tend to be nearing the end of their careers, while U.S. leaders are relatively young, and willing to experiment and take risks. The report contains various statistics relating research and development expenditures, technical personnel, education, national resources, and population. (*New York Times;* 13 January 1968)

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The National Research Council is establishing a new committee to consider the social implications of rapid advances in biology, medicine, and chemistry. The Committee on Biological Research, Social Behavior, and Social Policy will work over a three year period to help illuminate social, moral, legal, and ethical issues and problems of social policy now surfacing, and anticipate those that may arise in the coming decades. Among possible or probable causes of concern are: alerting the genetic make-up of individuals; predetermining sex of unborn children; increasing longevity and, postponing aging; influencing the brain and personality with chemicals; and routinely transplanting major human organs. More than half the Committee's membership will be drawn from the social and behavioral sciences. (*News Report*, National Academy of Sciences; February 1968)

(Continued on Page 5)

CHICAGO FAS CHAPTER OPPOSES TACTICAL NUCLEAR WEAPONS IN VIETNAM

On March 14th, George S. Stanford, Chairman of the Chicago FAS Chapter, released the following statement:

"If the United States cannot promise never to be first to use nuclear weapons, President Johnson should at the very least declare that we will never use them against a non-nuclear power. Up to now, the Government has refused to rule out using atomic bombs against the Vietnamese, but instead keeps the door open by saying only that we have no such plans.

"The Secretary of State has denied on TV that our troops at Khe Sanh are out on a limb—although they apparently are surrounded and terribly outnumbered. Does this mean that he feels that we can always use atomic bombs, "if necessary"? The time to decide against those weapons is before the battle starts, not after troops have been committed with the back-of-the-mind idea that there are always the "nukes", if worst comes to worst.

"Strategists have known for a long time that the most likely way for a major nuclear war to start is for somebody to get backed into a corner in some local conflict, and then feel forced to use nuclear weapons to get himself out. Recently some generals and Congressmen have called for A-bombs in Vietnam "if needed." But this country is not vulnerable to any weapons except nuclear ones. It would be idiotic to open that Pandora's box in trying to save some Khesanh or other.

"There is only one clear stop sign on the road to nuclear war, and that is before the first atomic bomb is used. As with taking heroin, the easiest time to stop is before the first "fix." And you don't wait with your decision until the local pusher is tempting you with a free sample."

In connection with the release of the statement, three members of the Chicago FAS Chapter appeared at a press conference in the Palmer House Hotel. They were former FAS Chairman David Inglis, Stanford, both at the Argonne National Laboratory; and Robert Gomer of the University of Chicago.

Inglis declared that "despite the Administration's faint denials, there seems to be a real danger that we might make the fateful blunder of escalating to nuclear war against the Vietnamese." From a tactical viewpoint, Gomer said, nuclear weapons are "not suitable" in Vietnam because the Viet Cong and North Vietnamese generally operate in small units. He pointed out that our own bases in Vietnam are much more vulnerable to nuclear weapons than are the enemy's, so that the disadvantages of nuclear weapons "far outweigh the advantages." Stanford said he would like to see this nation pledge that "we will never be the first to use nuclear weapons." (Press conference quotes from *Chicago's American;* 14 March 1968)

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Chairman ..... Jay Orear

The FAS Newsletter is prepared in Washington.

Editor: Harriette L. Phelps.

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The FAS, founded in 1946, is a national organization of scientists and engineers concerned with the impact of science on national and world affairs.

Sources of information (given in the articles in parentheses) are for further reference. Items reprinted directly from other publications are designated as such in an introductory paragraph.

VISAS FOR FOREIGN SCIENTISTS

(Continued from page 1)

and is loaded with many unimportant details of past connections."

These bad experiences are fewer now than fifteen years ago, but they still occur enough that the U.S. is regarded by too many foreign scientists as a poor choice for international conferences. The U.S. appears as more timid and bureaucratic toward foreigners than any other Western country. Communist Yugoslavia has announced elimination of the visitors visa for Americans this year, in honor of International Tourist Year.

It is fair to say that the visa situation has reached a rough plateau, with ups and downs related to levels of international tensions. Substantial progress to catch up with most other countries probably depends on revision of the xenophobic provisions of the McCarran-Walter act. For example, the U.S. might pattern new procedures after the Canadian example, eliminating visitors' visas for short-term visits.

Under the present visa laws with the numerous statutory provisions that make for delays, conference organizers would do well to familiarize themselves with the procedures and to take strong initiative to minimize difficulties for their foreign invitees. In this spirit, the FAS offers the following suggestions to conference organizers:

1. Issue conference notices and invitations early, and advise foreign scientists to apply for visas well ahead of time. If they must apply in a country other than that of their own citizenship, more time may be necessary.

> In the 133 responses to the FAS visa questionnaires no one reported failure to attend a conference because of visa delays, but delays still occur, even for non-Communist countries. Delays were more likely where the invitee applied in a country not that of his citizenship. One French scientist, who received his visa 23 hours before flight time, reported visa refusals to Gordon Conferences in previous years.

2. Advise foreign scientists whose visas are unduly delayed to let you know. You can, in turn, contact the International Scientific and Technological Affairs office of the State Department to request that the matter be expedited.

> A common cause of visa delays in non-Communist countries is that the individual is in a politically objectionable category defined in Sec. 212 (28) of the Immigration and Naturalization Act. The issuance of a visa to such individuals requires a specific waiver by the Attorney General. A "Group Waiver" procedure instituted in 1966 simplifies the process somewhat. (The Berkeley High Energy Physics Conference did not request a group waiver, but such waivers were in effect for Gatlinburg.) The "Group Waiver" was instituted to facilitate the admission of foreign invitees who have been found ineligible under sub-section (28) of Section 212(a) of the Immigration and Nationality Act. With reference to the "Group Waiver" the Consular Office at the Embassy abroad is still required to make a determination as to whether an applicant is eligible under sub-section (28) before the waiver procedure applies. The "Group Waiver" authority eliminates the need for the Embassy to refer such cases to the overseas regional offices of the Immigration and Naturalization Service or to Washington.

3. To make the "Group Waiver" procedure effective the Department of State should be notified as early as possible. Conference sponsors should address requests for a "Group Waiver" to the Office of International Scientific and Technological Affairs, Department of State, Washington, D.C., Attention: Mr. Arthur E. Pardee, Jr., Executive Director. Letters should include subject matter of the conference, dates and place of the conference, and a list of foreign countries from which participants are to be invited.

If applicants must apply for visas in a country other than that of their own citizenship, more time is necessary since the application must be referred to the U.S. Embassy in the country of citizenship before a visa can be issued. This referral, ordinarily by air mail, is to determine whether the applicant is eligible for a visa. If requested, telegraphic service can be used at the expense of the applicant.

Foreign scientists who require waivers should be specific as to the date when they will need the visa and the length of time they plan to be in the United States. If side trips are planned this fact should be considered in determining the length of time they wish to be in the U.S.

4. Visas for scientists from Poland, Czechoslovakia, Hungary, Rumania, and Bulgaria seem usually to be subject to delays, according to our survey. Thus, for them it is especially important to have early invitations and to apply for visas early. None reported failure to receive visas in time for these conferences, but we learned later of visa refusals to a Polish scientist working in Canada, wishing to attend New York and Washington APS meetings in 1967. Also, unless invitees or you arrange in advance for pre-conference or post-conference visits to U.S. laboratories, they will probably receive visas valid only for the dates of the conference. You should check early with the State Department about their current practices in this regard, perhaps requesting extra time to allow the option of scientific visits or tourism. Many large A.E.C. or industrial laboratories need to get advance approval for visitors from Communist countries.

5. Invitations to scientists in the USSR involve the Soviet Government to a greater degree than is the case with scientists and their governments in most other countries. Individual Soviet scientists are unable to travel abroad without permission of their government. This fact should be taken into consideration in allowing sufficient lead time for extending invitations. It is customary to send the invitations to the President of the Soviet Academy of Sciences (or other appropriate official, such as, Chairman of the State Committee for the Utilization of Atomic Energy, or Chairman of the Ministry of Education), although it is helpful to mail or deliver carbon copies directly to the invitees. We are told that it is advantageous if such invitations reach the USSR in the calendar year preceding the conference, since most travel funds for a given year are allocated before the end of the previous year. If you are arranging a tour of laboratories in conjunction with the conference, this tour might be mentioned in the formal invitation.

6. Scientists invited from unrecognized political regimes or countries with which the U.S. does not have diplomatic relations must apply for visas in person to the nearest U.S. Embassy or Consulate. For this reason and others, visas for scientists from the countries explicitly proscribed for U.S. travel in American passports (currently, People's Republic of China, North Viet Nam, North Korea, Cuba, and Syria) constitute a more difficult, but not necessarily impossible, problem. For example, the Berkeley High Energy Physics Conference issued invitations to scientists in Mainland China. It may be easier or harder than you think.

The FAS study is continuing, since our information is incomplete, being concentrated on only two physics areas and attendance at "international" conferences. We would be grateful for any additional information that American scientists can give us regarding recent visa experiences for foreign guests. These communications should go to Mrs. Fleischbein at the FAS office, Suite 313, 2025 Eye St., N.W., Washington, D.C. 20006. She will forward information to the current FAS Passport and Visa Committee. Its present members, who conducted this survey, are J. O. Rasmussen, Chairman; A. H. Rosenfeld, and J. Cerny of the University of California, Berkeley. If you would like to receive an expanded copy of this report, including the comments of respondents to the survey, please direct your request to the FAS Washington office.

NEWS ITEMS

U.S. energy consumption was at a record high in 1967. Total 1967 consumption was 59,197 trillion British thermal units (BTU's), a 4.1% increase over 1966 but slightly less than the 4.5% increase the year before. Petroleum remained the dominant fuel, providing 42.8% of the nation's total energy. Other sources and their share of the total were: natural gas, 31.2%; bituminous coal and lignite, 21.4% water power, 4%; anthracite, 0.5%; and nuclear energy, 0.1%. Although only small fractions of the total, nuclear and water power showed the greatest increases over 1966: 35.9% and 12.7%, respectively. (*News Release*, Department of the Interior, 12 February 1968)

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The Peace Corps has contracted with VITA to provide technical information to Peace Corps volunteers. VITA (Volunteers for International Technical Assistance, Inc.) has about 5000 volunteers, mostly scientists, engineers, businessmen, and educators. With the $20,000 Peace Corps contract, VITA will help Peace Corps volunteers with particular technical problems, which the volunteers may not be equipped to handle. A request from a Peace Corps volunteer to VITA will be channeled to a volunteer expert in industry or elsewhere; then the VITA and Peace Corps Volunteers will correspond, and try to thresh out and solve the problem. The Peace Corps money will cover the administrative costs of handling each request, up to 1000 requests in 1968. Approximately a matching amount for each request will be contributed from other sources. Since its founding in 1960, VITA has handled 1686 requests from Peace Corps volunteers, or 37% of all requests to VITA. (VITA News Release; 8 February 1968)

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Artificial "rain-making" has advanced into the realm of scientifically grounded facts, it was reported at the annual meeting of the American Meteorological Society. Not only is it possible for man to alter the weather to his will, but he is probably doing it already on a significant scale and unwittingly. One climatologist reported statistical evidence over a thirty-year period that atmospheric pollution from industry in the Chicago-Gary, Indiana area had increased rainfall by 31% at nearby LaPorte, Indiana. It was pointed out that this change "was greater than most increases claimed by even the most optimistic cloud-seeders." Also, completion of a two-year scientific cloud-seeding experimental program in California's Sierra Nevada Mountains has yielded some of the most comprehensive evidence yet that increased rainfall really results from this stimulation rather than chance variations.

Federal weather researchers said that they were on the threshold of consistently lessening the destruction of hurricanes by causing them to expend energy in artificially induced rainfall. Both the rainfall and hurricane series of experiments have depended on either silver iodide or dry ice particles projected into a cloud to form nuclei for raindrops. It is the careful accumulation of statistical data that leads to the new confidence of the meteorologists. (*New York Times;* 2 February 1968)

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New York City and the U.S. Government will jointly investigate the possible use of desalted water to meet New York's emergency water needs. An agreement has been reached between the city and the Federal Office of Saline Water in the Department of Interior. It is the first such cooprative study between the Federal Government and a major U.S. city. Desalting plants of various sizes, mostly nuclear, will be studied, along with considerations of geography, population, and expected water needs.

Last year Congress authorized the beginning of construction in Southern California of the world's largest desalting plant. That $440 million nuclear plant should produce 150 million gallons of fresh water each day. Key West, Florida, became the first American city to get its fresh water from the sea last July, when its plant began producing about 2.6 million gallons of water per day.

When the Federal saline water program began in 1952, 1000 gallons of fresh water were estimated to cost about $4. That cost has now dropped to about $1 at the several government desalting installations. A cost of about 22¢ per thousand gallons is expected for the Southern California plant. (*New York Times;* 12 February 1968)

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One interesting experiment for narrowing "the gap between the scientist and the layman" is in progress at the New School for Social Research in New York City. One night a week scientists meet with bankers, secretaries, advertising men, and "assorted other laymen" in a classroom. The laymen are enrolled in a "Science for the Citizen Program" at the New School. The course is but one of a number of programs aimed at educating the public on the implications of various scientific developments. The Scientists Institute for Public Information, in New York, functions as a coordinating unit for these efforts. The emphasis of the small, but effective, movement now is shifting from public speeches to the college classroom.

Adult education courses are one way of acquainting the layman with the impact of modern science and technology. Another approach is exemplified by a course taught by Barry Commoner at Washington University in St. Louis. His course in Biology in Modern Society accents such contemporary issues as pollution, racial problems, and genetics; and enrollment in the course has doubled over the last academic year. Another and fast-growing college effort in this general field comes under the broad general heading of science and public policy. Some 40 universities are grappling with the need for a more coherent analysis of the place of science in public life and in the minds of policy-makers. (*The National Observer;* 4 March 1968. See also the article by Leonard S. Rodberg on page 1 of this issue)

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Structural damage from sonic booms may not be too great a hazard, according to a subcommittee of the Academy of Sciences. But this very tentative conclusion applies only to supersonic aircraft operating in a normal manner (and to structural damage only), and the NAS group urges that steps be taken to explore many remaining areas of uncertainty. The Subcommittee on Physical Effects of the NAS Committee on the SST-Sonic boom outlined areas of concern and a number of research and testing programs that are needed to predict sonic boom effects. Uncertainties include: climatic and geographic conditions; different types of aircraft and aircraft operations; the nature of responses of damage-susceptible materials to sonic booms; and the interactions of sonic booms with other stresses such as thunder, wind gusts, and traffic and earth tremors. The NAS committee suggests that various laboratory experiments can be substituted for actual flight tests with supersonic aircraft. (*News Release*, National Academy of Sciences; 5 March 1968)

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The nation may be slipping into a "let-technology wait" period that holds "potent social and economic dangers," according to Representative Joseph E. Karth (D-Minn.), Chairman of the Subcommittee on Space Science and Applications of the House Science and Astronautics Committee. Karth noted with concern the "leveling off of federal support" of research and development at about 2% of the gross national product—down from 2.3% in 1964. He argued that "technology seems to be a major prerequisite for eco-

CAMPUS INTEREST — from Page 1

York at Albany. The role of such interdisciplinary centers in aiding public understanding of the uses of science, and the possibility of developing institutions such as these to improve our ability to forecast technological advances and deal with their consequences, were emphasized in the discussions.

Readers of the NEWSLETTER knowing of other meetings, research programs, or courses dealing with science and modern society are invited to communicate this information to the Editor for transmission to our readers. In addition, Prof. Eugene Skolnikoff of the Department of Political Science, MIT, is establishing a clearing house for information on work in this field, and he would welcome hearing of such efforts as well.

INTERESTING READING

"Major activities in the Atomic Energy Programs," January-December 1967. Published in January 1968 by the Atomic Energy Commission. 390 pages. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington D.C. 20402 for $1.50.

"Seventh Annual Report of the U.S. Arms Control and Disarmament Agency," covering the calendar year 1967. Transmitted to the Congress by the President on 12 February 1968. 74 pages. Available from the Government Printing Office.

"Scope, Magnitude, and Implications of the U.S. Anti-Ballistic Missile Program," hearings on 6 and 7 November, 1967, before the Subcommittee on Military Applications of the Joint Congressional Committee on Atomic Energy. 454 pages. Available from the Government Printing Office for 45¢. (Includes statements of various expert witnesses, interesting charts and other technical items. The 14 appendixes include texts of the outer space treaty, the September speech by Defense Secretary McNamara announcing plans for deploying the Sentinel system, an interview with McNamara from *Life* in September, a *Look* article by Jerome Weisner, and other statements and speeches. A good source of facts for anyone interested in following the ABM debate.)

"Stopping the Spread of Nuclear Weapons," a report of a national policy panel established by the United Nations Association of the U.S. 50 pages. Available for $1.00 from: UNA-USA, 345 E. 46th St., New York, N.Y. 10017.

"Earthquakes/Explosions." The November-December 1967 issue of Scientist and Citizen includes three articles on various aspects of the nuclear test ban. A good source of dates, numbers, summaries of positions, and various references. Available from the Committee for Environmental Information, 5144 Delmar Blvd., St. Louis, Mo. 63108.

"Disarmament: A Guide to Understanding the Problem." The 50-page January-February 1968 issue of *Intercom*, the bi-monthly resource publication in the world affairs field published by the Foreign Policy Association, 345 E. 46th St., New York, N.Y. 10017. Available for $1.00.

"Chronology of Principal Events Relating to the Non-Proliferation Treaty," No. 505 in the "Disarmament Document Series" published by the U.S. Arms Control and Disarmament Agency (ACDA). A 29-page document which covers events from 1961 to January, 1968. (Emphasis on recent events, with a concise paragraph or two summarizing each. For information on availablity, write to ACDA.)

(NEWSLETTER Editor's note: For reasons of space, a fairly long list of recent periodical articles of interest must be held over until next month.)

NEWS ITEMS

nomic progress, which in turn makes possible social progress." Karth argued that those who press for the solution to urgent social problems must understand that the best way to solve them is to strengthen the economy, and that the U.S. economy has come to depend increasingly on vigorous science and technology. Karth particularly singled out the space program, criticizing both NASA and the Budget Bureau for sharing a "let it wait" attitude with respect to the earth resources program which would apply satellite technology to weather forecasting, forestry, the search for new mineral resources, water management and other practical applications. (*New York Times;* 6 March 1968)

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An earthquake of man-made origin may threaten Denver this year. An analysis of seismic records from the Denver vicinity has persuaded a number of experts that unless remedial action is taken—and perhaps despite such action—an earthquate could inflict serious damage this year. The focal point of the problem is a well, 12,045 feet deep, at the Army's Rocky Mountain Arsenal on the outskirts of Denver. The well was drilled for the disposal of poisonous waste water, apparently a by-product in the production of chemical warfare agents, including nerve gases. Experts at the National Center for Earthquake Research, operated by the U.S. Geological Survey in Menlo Park, Calif., believe that the dumping of water into the well near Denver has produced a series of earth tremors. There is strong sentiment at the Center in favor of trying remedial action, but there is also fear that the remedy itself might set off more severe tremors.

In the years 1962-66, some 160 million gallons were pumped down the well. The Denver region, previously free of noticeable earthquakes, began to feel a succession of small quakes. The quakes behaved in a uniform and predictable manner until last year. But in 1967 relatively severe quakes became more frequent and three quakes were of sufficient magnitude to do slight damage.

It is suspected that the water pumped into the well near near Denver may have worked its way downward, producing an unstable seismic situation at a great depth. The proposed remedy at Denver is to try to pump the waste water out of the well, but it is not clear what results this could have. The existence of unstable rock about 2 miles down in the well is suggested by the fact that, when the Army began pumping in 1962, waste water flowed down the well steadily. But suddenly the flow rate jumped by a factor of 200, suggesting that the water pressure had cracked open deep rock. (*New York Times;* 8 March 1968)

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More knowledge more widely distributed is the best defense against the fruits of science, according to Nobel laureate Arthur Kornberg of Stanford. He discounted the idea that research posed special moral, social, or political problems for mankind. Kornberg told a hearing of the Senate Subcommittee on Government Research that as public issues develop in the future, they can best be dealt with by having a public well educated in the general concepts of science and in a scientific community richly supplied with data.

The subcommittee is considering a resolution that would set up a National Commission on Health, Science, and Society. The Commission's role would be to consider some of the trends of recent biomedical research and the implications they raise for public policy. Recently publicized issues include heart transplantation and the possibility of making genetic changes in humans.

Also appearing briefly before the subcommittee was Dr. Christiaan Barnard of Cape Town, whose second heart transplant patient is still alive. Barnard argued against commissions of the sort proposed, noting that they had ham-

NEWS ITEMS

pered the progress of medicine in almost every comparable case. The resolution to create the commission was chiefly an aftermath of the heart transplants accomplished by Barnard and others and the report of Kornberg and his colleagues that they have produced artificially the active, infectious inner core (DNA) of a virus. Both Kornberg and Joshua Lederburg, also a Nobel Prize-winning geneticist at Stanford, noted that the recent dramatic developments in biomedical science were simply episodes in the major scientific revolution that had been in progress for decades. Kornberg said that is seemed to him that Federal support for nucleic acid chemistry and other areas of basic research had never been adequate and in the 1968 budget dropped below the critical point. (*New York Times;* 9 March 1968)

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A dozen young MIT professors will work full-time with city officials on urban problems. In this first-of-its-kind effort, the assistant professors from MIT will go beyond the usual consultant's role. The cities will pay the professors' salaries, but MIT will provide traveling and moving expenses and will reimburse them for any outside work they might have to give up. MIT will also give them full credit in terms of faculty tenure. New York City Mayor John Lindsay called the MIT action "responsive to the action and change in cities." MIT President Howard Johnson said that "the most effective transfer of information, knowledge, and technological know-how can be accomplished by people moving between one sector and another, carrying both an understanding of the needs and an approach to systematic solution of problems." Johnson looked on the urban fellows from MIT as a kind of advance guard in creating more communication between the university and public officials. As the fellows return to MIT, their practical experience should help them to influence graduate students, creating a steady stream of trained young men for careers in urban affairs. The MIT program is supported by grants from the Ford Foundation and is directed by Carroll L. Wilson, a former General Manager of the Atomic Energy Commission and since 1951 a Professor of Management at MIT. (*New York Times;* 12 March 1968)

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Men, especially through their governments, are playing "brinkmanship" with the earth's natural resources. This charge was made by Ira N. Gabrielson of the Wildlife Management Institute, who said that governments in general fail to provide adequate conservation laws and regulations. Gabrielson spoke out at a meeting of the North American Wildlife and Natural Resources Conference in Houston. Other conservationists at the meeting said privately that governments were playing "Russian roulette" in dealing with the protection of nature for man and his descendants. Examples of governments' failure to look ahead include the problem of water and air pollution. Gabrielson and other conservationists were especially critical of the U.S. Government's failure to take policy positions promptly and follow through with sufficient funding, to make sure that natural resources are protected and that clearly foreseeable problems such as water and air pollution are effectively met. (*New York Times;* 12 March 1968)

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Observation satellites could be of very limited help in the coming tornado season. The Applications Technology Satellite (ATS-3) is focusing its cameras on suspicious cloud formations in a special effort to determine how these destructive storms gather and strike. The satellite, launched last November 5th, is in a synchronous orbit approximately over the East Coast of South America. It can photograph cloud patterns over the northern hemisphere every 15 minutes. On days when storms are brewing, NASA can radio instructions for the on-board camera to photograph North America at 15-minute intervals during daylight hours. Movies will be prepared from the photographs to see if tornado-breeding situations can be identified from characteristic cloud motions before the tornadoes themselves develop. If the planned series of experiments is successful, they could lead to proposals for using satellites to provide an early-warning system for tornadoes and other severe storms. (*New York Times;* 14 March 1968)

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Atomic energy may be the major contributor to the solution of India's awesome development problems. This is the view of many Indian scientists and other observers. The Indian nuclear program is centralized at the Bhabha Atomic Research Center at Trombay, near Bombay on the West Coast of India. The sprawling Center will pump 1000 more megawatts of badly needed electrical power into the Indian national grid by 1972, at the same time it carries on research on agricultural and other problems of development. Besides being a high point of Indian technical development, the Center is a source of national pride. It is also a source of controversy, because of the cost of the program and because of concern among the larger nuclear powers that the growing Indian vigor in nuclear research makes it less likely that India will sign and abide by a non-proliferation treaty.

Indian dissatisfaction with the protection guarantees proposed by the U.S. and the Soviet Union in the current NPT drafts are expressed even more strongly at Trombay than in New Delhi. India's nuclear program is officially dedicated to peaceful purposes, and there is so far no evidence of any other applications. But the essentials of a bomb-making apparatus are to be found in India. These include three experimental reactors; a 40-megawatt reactor at Trombay, plus a plutonium plant; a new reactor some 60 miles north of Bombay being built with U.S. AID funds and scheduled to begin generating 400 megawatts of power in October; and a similar station under construction with Canadian cooperation in northwestern India. In addition, a uranium isotope separation plant is undergoing trial runs, and a larger plant for isotope separation is planned. (*New York Times;* 17 March 1968)

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The U.S. space program has again been defended in terms of its practical and economic benefits. But William D. Capron, a former assistant director of the Budget Bureau, questioned some of the most optimistic forecasts of the economic benefits that space offers, such as a "startling" estimate that improved weather forecasting would add as much as $15 billion a year to the world's agricultural output. He compared this with a recent National Academy of Sciences' estimate that weather forecasting with satellites could benefit agriculture and construction in this country to the extent of about $1 billion a year. But he noted that "even the more modest forecast hold out an exciting significant prospect." Capron, who is now with the Brookings Institution in Washington, noted in a recent speech that the space community is turning increasingly to economists as it seeks practical returns for the nation's investment in space technology. Economists and others have found it extremely difficult to predict quantitatively the benefits of space technology such as the application of observation satellites; but they have "generally expressed a strong faith" that large economic returns will come and have urged further studies. Capron noted incidentally the generally growing role of economists in Washington as analysts of decisions on public expenditure. (*New York Times;* 17 March 1968)

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A U.N. committee has begun work on a treaty governing the exploration and development of the ocean depths. The 35-member committee was established last December by a unanimous vote of the General Assembly but its first meeting was held on March 18th. In opening the meeting, Secretary General Thant said: "The pace of progress in the development of science and technology is such that it is clear that more and more of the seabed and ocean floor is becoming accessible on one way or another and can be exploited for scientific,

NEWS ITEMS

economic, military, and other purposes." Thant noted the obvious need for international cooperation in this field. Earlier, in creating the committee, the General Assembly laid particular stress on preventing the use of the ocean depth for military purposes. The committee will discuss first steps toward a body of international law to regulate exploration and development of the wealth and mineral and food sources that have been technically inaccessible so far. The committee is expected to draft a work program at the current first series of meetings and to present the results to the next session of the General Assembly, opening in September. All member states were asked to submit views and suggestions. The United States has suggested that the first aim of the committee should be "substantially informational," then the committee should turn to a summary of scientific, technical, economic, legal, and other aspects; and finally should analyze future cooperation. (*New York Times;* 19 March 1968)

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A House subcommittee is asking $3 million next year for the International Biological Program, a five-year cooperative study of plant, animal and human life initiated by about fifty nations. The main purpose of the study is to find out, perhaps before it is too late, just what man and technology are doing to life on earth. There is concern that many changes now going on are bad and unpredictable, and that some may be irreversible. The House Subcommittee on Science, Research and Development issued a report saying that the international program deals with "one of the most crucial situations to face this or any other civilization—the ecological system of the planet on which all life depends."

The first major research efforts in the U.S. part of the program were announced last year. Some studies here and abroad are now going on. The Subcommittee said that U.S. participation "appears to stand on shaky ground—organizationally and financially." The Subcommittee asked that the national committee for the American program tighten its management structure and it also called for federal support in the $3 to $5 million range in fiscal 1969. Thereafter, it asked for a firm commitment by the Government to support the program for the full five years.

The 124-page committee report listed many effects of man on soil, vegetation, animal life, and climate that might jeopardize to an unknown degree the world as it is now. The end results cannot be predicted by scientific knowledge today, it said. Specific problems mentioned were the defoliation and clearing of jungles, diversions of rivers and lakes for irrigation, pollution of water and atmosphere, and the generation of huge amounts of heat by cities and industrial complexes. Among the large-scale, possibly irreversible, effects cited were drastic changes in the Great Lakes in recent years which endanger the usefulness of the world's largest body of fresh water. The report noted that Lake Erie is virtually dead, and Lake Michigan and the others may be on the way to the same fate. The subcommittee chairman, Representative Daddario (D-Conn.) said that the effects of man's conflicts with his own environment might dwarf those of any war fought on earth. (*New York Times;* 20 March 1968)

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Army experiments with nerve gases have probably killed some 6,400 sheep in Utah. The head of a special Utah State investigating team said that "we are as positive as medical science can ever be" that the death of the sheep in Western Utah's Skull Valley was linked to operations carried out at the Army's Dugway Proving Grounds on March 13th. The team reported that "we have narrowed the cause of death to an organic phosphate compound—the kind that is a component of nerve gas. Since the Army has admitted conducting nerve gas tests the day before the sheep began dying, that would seem to clear the matter up." An Army spokesman reported that the military investigation was continuing, and that "no definite cause of death" had been established. (*New York Times;* 24 March 1968)

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