

F. A. S. NEWSLETTER

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Augustus H. Fox, Chairman

----- to provide information
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No. 59-3

March 11, 1959

GENEVA IMPASSE

The Geneva negotiations on a nuclear weapons test ban have come to an absolute standstill. Soviet insistence on comprehensive veto rights over any and all operations, including on-the-site inspection, remains a major stumbling block. If not subject to compromise this in itself promises to dash all hopes for an agreement. In addition the Soviet refuses to let nationals of other countries man inspection sites in Russia, although they recently relented and offered to allow a small number of representatives from other countries to join predominantly Russian teams. Meanwhile, even though President Eisenhower has reiterated that we in the US "... very, very definitely want some kind of an agreement", the confusion and debate over detectability of underground explosions has raised doubts about the earnestness with which this country approaches the test-ban problem.

Debate Reopened

One of the key witnesses appearing before Sen. Humphrey's Disarmament Subcommittee was Dr. Hans Bethe, a member of the President's Science Advisory Committee and a former Vice-Chairman of FAS. The censored version of Bethe's testimony listed four simple modifications of the inspection system that would "bring us back to the original capability" of detecting underground blasts and thus resolve any doubts arising from the new data on seismic detection. What Dr. Bethe called for was 1. deeper placement of the seismographs (6,000 feet) to cut down background noise; 2. addition of unmanned seismic detectors to increase coverage of territory; 3. increasing from 10 to 100 the number of seismographs at each station and 4. use of instruments specifically designed to detect surface shock waves.

Testimony by Dr. James Fisk, who headed the US delegation at Geneva last year, made it clear that there is no obstacle to modifying the inspection system in these ways and that the delegates' report explicitly takes account of the continuing need to reassess and improve the detection system in the light of new research and developments. Indeed at these same hearings, Dr. Bethe revealed a proposal to include in the final detection system a method for detection of explosions in outer space. This would call for appropriately instrumented orbiting satellites which would pick up the radiation from super-stratosphere tests. Additional information on the feasibility of underground detection is expected in the next few weeks upon release of the report of the Panel of Seismic Improvement. The Panel, headed by Lloyd V. Berkner, is an offshoot of the President's Science Advisory Committee.

Humphrey Attacks Censorship

In a speech at Northwestern University on Feb. 13 Sen. Humphrey leveled a blistering attack on the censorship within Government which has "gagged" members of the Science Advisory Committee and other defenders of the declared public policy of seeking a test ban "while those who oppose it within the Administration have relatively free hand in expressing their opposition." His clear implication was that the public confusion of the past few months concerning the feasibility of detection was the direct result of allowing the opponents of a test suspension (listed by Marquis Childs (W. Post 2/25) as "most of the Pentagon, the Atomic Energy Commission, Edward Teller . . . and the scientists in his camp") to publicize their interpretation of the data without adequate airing of the facts themselves or of the differing interpretations of them as discussed above. Humphrey charged that the Administration is "... a Government in which decisions are not being made, because there is no leadership at the top."

(continued on page 4)

SPACE-RACE DEVELOPMENTS

In the past few weeks, the US has taken several strides forward in its space exploration program. First came Vanguard II, a 20 inch, 20 lb. sphere which is now gleaming meteorological data from a 600 mile swath around the earth. On March 3, the Army successfully launched Pioneer IV, a deep space probe, which was shot past the moon and is now in orbit about the sun. Pioneer IV carried an instrumental payload of 13½ lbs. and telemetered back temperature, radiation and cosmic ray data. Contact with Pioneer was lost after it had travelled 400,000 miles out in space. The Air Force made its contribution on March 2, launching its first "Discoverer" satellite. After some initial confusion as to its success, the Defense Dept. announced that it was in orbit but that a stabilizing device designed to prevent the satellite from tumbling had failed to work. This apparently upset the planned directional pattern of its radio signal. The Discoverer is a 1300 lb. satellite and the first US one to be put into a polar orbit.

How Much and Who's Boss

These past few weeks have also seen the emergence of some interesting conflicts in regard to the budget requirements and administrative responsibilities of the various space agencies. These conflicts were made public during the various congressional committee hearings underway at present.

Rear Adm. John T. Hayward, the Navy's research chief testifying before the House Space Committee indicated that much of the military and civilian space program should be merged; that the current many-headed arrangement was detrimental to our progress (W. Post, 2/6). However, Army Secretary Wilbur M. Brucker told the same committee he was opposed to the idea of merging the civilian and military programs. Again before the Senate Space Subcommittee, NASA chief Glennan testified (W. Post, 2/20) that it was too early to tell if the entire program should be under one agency or to leave it as it is with the military phase under ARPA. He advised against the creation of a joint agency.

More Money Next Year

Glennan also indicated that the space program would continue to grow—"this is the last year we will ask for as little as a half billion dollars," and that—"I will be surprised if we aren't asking for a billion dollars a year in about two years." These statements were made during hearings on a bill to provide a supplemental appropriation for \$48 million to speed up the present civilian program. NASA's 1959 budget is a little more than \$300 million. The 1960 request is for \$485 million. (The supplemental would cover funds for the manned satellite program—Project Mercury and many more tracking stations over the world).

"Who's On First"

It was at these same Senate Space Committee hearings that the apparent confusion as to who was boss of who came out and received national coverage in an article by Drew Pearson (W. Post, 2/9). Pearson quoted testimony of Roy Johnson, present Director of The Advanced Research Project Agency and Dr. Herbert York, Director of Research and Engineering for the Defense Dept. (see NL 59-2)—each indicating that he was "boss" of all. Several days later (W. Post, 2/13) undoubtedly prompted by this confusion, Defense Sec. Neil McElroy issued a directive giving Dr. York prime responsibility over all other defense agencies and services in the space and missile field.

RADIOACTIVE WASTE DISPOSAL PROBLEM

Last month the Joint Senate-House Committee on Atomic Energy ended a sorely needed series of public hearings on problems connected with the disposal of radioactive wastes from nuclear reactors. Despite the much greater amount of publicity associated with radioactive fallout from nuclear bomb testing, radioactive contamination from the waste products of the rapidly growing nuclear power industry throughout the world would appear to offer a far more serious problem in a peaceful world. In his testimony, Dr. A. Wolman, of Johns Hopkins University, estimated (*Science*, Feb. 13) that in 1980 the accumulated high level radioactive waste volume will be of the order of 10^8 gallons. The total fission product activity will then be approximately 10^{14} curies. Furthermore these waste products must be carefully stored for several hundred years because of the long half lives of some of the radioisotopes (e. g. the radioisotope, Americium 241 has a half-life of 510 years). Rep. Holifield dramatized the problem by noting that the quantity of Strontium 90 produced will be so large by the year 2000 that 16 million cubic miles of water would be needed to dilute it safely—more fresh water than there is in the world, including the polar ice caps.

AEC Stresses Two Points

Among the many cogent points made by Dr. Wolman in his testimony before the Joint Committees were the following: "Up to the present time the management of radioactive waste materials, under the continuing and careful scrutiny of the AEC, has followed two general precepts for the protection of man and his environment. . . . These precepts are: with high level radioactive wastes, concentrate and contain; with low and intermediate-level radioactive wastes, dilute and disperse to nature."

"The protection of the public health and of the total natural resources of this and every country entails a greater depth of continuing responsibility than for any other industrial waste hitherto confronting society." . . . "Although a great deal of attention is now being paid to this problem, to many industrialists the problem of waste disposal appears to be non-existent. The reason for this happy state of mind lies in the fact that under present procedures the AEC holds itself responsible for the handling of these most difficult materials." . . . "The rapid development of the atomic energy industry is in no small measure contingent upon more prompt and more complete answers to the waste disposal problem."

In general the witnesses praised the AEC for its handling of the waste disposal problem to date. However it is clear that despite the past safety record the problem of waste disposal has not been solved. Much research needs to be done on new methods to concentrate and store high level waste material.

SCIENTISTS URGE STUDY OF OCEANS

The Committee on Oceanography of the National Academy of Sciences, National Research Council, warned that the United States must—within the next ten years—double its present rate of deep-sea research or face serious economic, political and military hazards (*W. Post*, 2/16). Members of the Committee emphasized that the Soviet Union would soon be world leaders in oceanographic research if the United States did not step up its effort.

After a one-year study this Committee concluded that a much greater knowledge of the ocean depths is needed for many military, scientific and economic purposes.

Chief among the military purposes is the necessity of mapping the ocean bottom so that missile-launching submarines can determine their exact location to within a few hundred yards from the topography of the ocean floor. They estimate that at least thirty percent of the ocean floor must be charted—so far only one percent has been. This country should "be in a position to negotiate an adequate international submarine control and monitoring system." The development of adequate detection and tracking devices will be necessary in order to "make the oceans transparent."

Another important study is the determination of the effect of radioactive waste disposal upon the oceans and marine organisms. The Committee pointed out that the effects of atomic waste disposal should be monitored by a different agency from the one that regulates the disposal. This was an obvious criticism of the present set-up in which the AEC monitors itself.

The Committee recommended a ten-year program of \$651,-

PEACEFUL USES OF ATOMIC ENERGY

The Jan. 30 issue of *Science* carried Sir John Cockcroft's summary of the second UN Conference on Peaceful Uses of Atomic Energy. From this report it appears that nuclear energy is well on its way to an importance in commerce and industry comparable to that it already enjoys in medicine. Although the costs of electrical power from present nuclear generators are still well above that from English coal or oil-fired stations, fuel costs are already lower than for conventional fuels, and the expectation is that by 1962 technical improvements will reduce capital costs to the point, where parity will be achieved ". . . with coal-fired stations in areas in Britain away from coal fields." Nuclear power would be competitive now in countries like India and Japan, the Conference was told, but would ". . . not perform miracles in underdeveloped countries" where power requirements and load factors are low, and technicians scarce. Parity will not be achieved for another decade in countries like the US with abundant fossil fuels and hydroelectric power.

Known nuclear reserves are ample for at least the next two decades and Cockcroft concludes that "with the efficiencies which might be achieved by breeding, 10 million tons of uranium are equivalent to 10^{10} tons of coal; this is three times the world's estimated coal reserves. We are likely to have developed fusion power long before we run out of uranium. Aside from power generation, the uses of radioactive materials is expanding. Nuclear ship propulsion, though proved feasible by the *Nautilus*, is still much more expensive than conventional propulsion, but several experimental vessels are being planned. "Commercial nuclear aircraft propulsion seems much further away," according to Cockcroft.

EURATOM

On the international scene, attention is focused on the hopes of the 6-nation European Atomic Community (France, Italy, Belgium, the Netherlands, Luxembourg and West Germany) to achieve 1 million kilowatts of nuclear-generated electrical power by the end of 1963. To this end Euratom has signed agreements with the US AEC for enriched fuel and reactor components and with Britain for reactors (*NYT*, 2/5). Simultaneously, a cooperative plant for processing nuclear fuel is being built in Mol, Belgium, under 12-nation sponsorship (*Wash. Post*, 2/3). On the domestic scene, the AEC has come under recent Congressional criticism. Sen. Gore said, "unless the program is speeded up the United States may find itself 'a poor third' next to Russia and Great Britain in the construction and operation of large scale atomic plants" (*Wash. Post*, 2/19). The proposed 1960 budget, in particular was characterized as "inadequate" and "disappointing" by Sen. Clinton Anderson, (*NYT*, 2/27) and castigated by committee member Holifield for its "pitifully small" civilian atomic power program and the cancellation or cutback of several experimental and pilot reactor projects. As outlined by Anderson, the basic obstacle is that "the economic spur is lacking" because of our abundance of cheap fossil fuel. Accordingly, industry is reluctant, on the one hand, to make the necessarily heavy investment of private capital, and, on the other, to ask for financial assistance for fear of Governmental control and ultimate Federal ownership with its attendant competition. McCone's unenviable buffer position between advocates of private and public power was well illustrated when he came under attack from the National Rural Electric Cooperative Association for suggesting before the Joint Committee that industries be granted 50% of the capital costs of atomic projects. (*W. Post*, 2/25). IAEA

Sterling Cole, Director General of the International Atomic Energy Agency, called for greater efforts towards realization of President Eisenhower's Atoms-For-Peace proposal made at the UN five years ago. Mr. Cole criticized the lack of truly international arrangements for the peaceful exploitation of atomic energy. He cited US and USSR's overemphasis on special and bilateral agreements which bypass the IAEA and prevent it from developing into an international headquarters for a growing, world-wide atomic energy program.

000,000; about 43% contributed by the Navy, and smaller amounts from the Bureau of Commercial Fisheries, the Coast and Geodetic Survey, the AEC, the Bureau of Mines, and others. In contrast, the total amount spent during 1958 was \$23,000,000.

BOOK REVIEWS

THE GREAT DECISION. The Secret History of the Atomic Bomb. By Michael Amrine, G. P. Putnam's Sons, New York. \$3.95.

"Nightmares of war ended and we found that there would be nightmares of peace. . . ." "In this way began the atomic world in which our children . . . must find their way." Since the dawn of the atomic era, thoughtful men, haunted by the specter of annihilation, have wondered whether we should have dropped the nuclear bombs on Japanese cities. In "The Great Decision" Michael Amrine wrestles with questions such as this. He tells of agonizing decisions made during the hundred fateful days between the death of Franklin Roosevelt and the bombing of Hiroshima. To one who lived through the exciting wartime days at Los Alamos, Amrine's account rings true. It is a fast-moving narrative, skillfully told.

The author has long been concerned with the human problems engendered by our advancing technology. Through years of close association with nuclear scientists, as publicist for the Federation of American Scientists and the Brookhaven National Laboratory, he acquired a keen insight into their motivation and Weltanschauung.

Amrine was troubled by questions such as these: Who made the decision to drop the bomb the way it was dropped? Was this an American decision, or was it a decision of the Allies, with Britain as a partner? Did the bombs win the war or did they merely "close" the war? Answers were sought in the memoirs of Truman, Stimson, McCloy, Byrnes, Leahy, Compton, and others.

One of the central figures in the drama is that of Henry L. Stimson, an extraordinary prescient Secretary of War. His profound understanding of the world problems raised by the large-scale release of energy from fission, move the reader to feel, with Truman, "how fortunate the country was to have so able and so wise a man in its service." Yet, wonders Amrine, how much was the thinking of Truman and Stimson limited and conditioned by the desperate pressures of those days? How much attention was paid to the dire prophecies made by the scientists even before the first nuclear bomb test at Alamogordo?

The author has tried—with notable success—to be the objective reporter. He studied available sources, and also corresponded with some of the principals in the story to clarify obscure points. Sometimes he was stymied by the wall of secrecy that still surrounds certain historical documents of the period. Amrine's journalistic restraint was, however, deliberately relaxed in the last chapter, where he gives his own conclusions to some of the problems raised by his inquiry.

The book closes with several burning questions for our time: Are governments better equipped today, than they were in 1945, to act wisely when they have received news of revolutionary developments from science? What men will make tomorrow's weapons decisions? Will the world's third combat atomic bomb be exploded through the decision of a military commander in some local situation?

The publication of Amrine's book is an event of special interest to members of the FAS. However, everyone who has wondered about the thinking and feeling that went into the awesome decision to use the A-bombs in combat, will want to read it. Maurice M. Shapiro

LIBBY RESIGNS FROM AEC

On February 18th the White House announced the resignation of Dr. Willard F. Libby from the Atomic Energy Commission. Dr. Libby, originally associated with the Manhattan District Atomic Bomb project was Professor of Chemistry at the University of Chicago's Institute for Nuclear Studies when he returned to the government as one of the five AEC members. The only commission member with an extensive scientific background, Dr. Libby has been the Administration's leading spokesman in the nuclear weapons testing controversy. His resignation was apparently due to his desire to return to teaching and research. He has recommended that two of the members of the AEC be scientists rather than one, and expressed the feeling that this nation has not been developing atomic energy for peaceful purposes fast enough (W. Post, 2/21).

MISSILES AND DEFENSE

In the month since the last Newsletter (59-2), the issue of US missile development has been extensively debated, both in Congress and in the press, but firm facts are still hard to obtain. The situation has been further muddled by linking the defense budget with the Berlin crisis, and by the political controversy surrounding the President's rigid position on a balanced budget. On March 6, President Eisenhower held two important meetings; the first with Congressional leaders, and the second with representatives from the departments of State and Defense, CIA, White House staff and leading Congressmen from the foreign affairs and defense committees. Eisenhower stated at that time (NYT, 3/8) that his original defense requests included sufficient funds to defend Berlin, if necessary, and that "the Russians were working on a strategy of 'spending the US into bankruptcy'." Congressional leaders, however, felt that the Administration was more concerned with balancing the budget than with balancing the Nation's defense establishment with its political commitment abroad or keeping up with Russian missile development.

One factor which has made for confusion, both in the press, and in Congress is the discrepancy between the Administration's position, as stated by the President and the Secretary of Defense, Neil McElroy, and the testimony of certain Defense Department officials. For example, two Army generals, Maj. Generals, W. W. Dick, Jr., and D. E. Beach, told the House Space Committee that Secretary McElroy rejected their urgent program to produce a defensive missile against Russian intercontinental rockets — the Nike-Zeus anti-missile missile (Wash. Post 2/10). The next day, Assistant Defense Secretary McNeil told the Joint Economic Committee that the Nike-Zeus program has unlimited access to men and money (Wash. Post 2/11). The House Space Committee is now investigating these contradictions.

Recent claims by the Russians that they now have ICBM's sufficiently accurate to make American retaliatory forces obsolete have further sharpened the debate between Congress and the Administration. The Administration has declared that the Soviet Union cannot coordinate its missile power sufficiently to knock out the US's retaliatory capability (W. Post, 2/5).

The chairman of the House Military Appropriations subcommittee, George Mahon (D, Tex.) has, however, predicted the appropriation of additional funds requests for missile spending in the next few years are even below those of last year (W. Post, 2/17).

The FAS is a national organization of scientists and engineers concerned with the impact of science on national and world affairs. The Newsletter is prepared in Washington by FAS members. The staff for this issue included, Editors: M. Elkind, H. Goldfine, M. Singer; Writers, H. Goodman, N. Seeman, G. Snow, D. A. Melnick, V. Lewinson, B. Wright, J. Buck and D. Steinberg; Production: I. Shapiro, of the Washington Office Staff.

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FALLOUT INCREASING IN FOODS

The maximum permissible concentration (MPC) for strontium-90 in milk is 80 Sr units or 80 micromicrocuries per gram of calcium as recommended by the International Committee on Radiation Protection (ICRP). The ICRP has estimated that this amount of radioactivity taken over the long term will deposit about 0.1 microcurie in bone which is the recommended MPC for humans. Although normal metabolic processes discriminate against strontium, its chemical similarity to calcium causes it to be deposited primarily in bone where it may induce bone cancer or leukemia. Eighty Sr units is also being used as the maximum permissible concentration in other foodstuffs for want of better data. The MPC's for foods are based upon the assumption that a particular item, like milk, will be the only consumed source of calcium. Hence, in theory the food MPC's recommended by the ICRP should prevent the accumulation of a bone MPC as long as the average Sr-90 concentration in the total diet is less than 80 Sr units.

Levels Increasing

Measurements made by the AEC and the PHS, as well as independent determinations by **CONSUMER REPORTS** (March 1959), report increasing levels of Sr-90 in foods. St. Louis, Mo., has consistently been the city with the highest Sr-90 level in its milk. The yearly average for 1958 was 13.2 Sr units; the highest value reported was 32.7 Sr units in August, 1957 (W. Post 3/1). Presumably the cow fodder used for feed had 7 times this many units, since in the process of milk formation the strontium to calcium ratio is reduced by a factor of about 7.

Compared to milk, radioactivity levels in wheat, barley and soybeans are, in fact, much higher, particularly in the Midwest. Fifty-seven samples of Minnesota wheat for the years 1956-58 ranged from 28 to 80 Sr units, and one sample in 1957 was as high as 113 Sr units (W. Post 2/27).

Fallout is highest in countries above the equator, because most of the tests have been made in the northern hemisphere and wind movements are predominantly easterly and westerly. Fallout is higher in the US than in Formosa, Southeast Asia and even Japan, which is between the US and Russian testing grounds.

According to retiring AEC Commissioner Willard Libby, the average radioactivity in food was "well below" the maximum permissible level (based on milk, presumably) and that no one is getting "excessive amounts" of strontium-90 in their diet (NYT, 2/28). On the other hand, the AEC predicted that the fallout will probably double or triple, reaching a peak around 1970, if no further tests are made. Moreover, if weapons tests are continued at the past rate of 10 megatons of fission per year, fallout will go up to 7 or 8 times the present level by 1970. (W. Post 2/27).

FAS NEWSLETTER

Federation of American Scientists
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GENEVA (continued from page 1)

With mounting concern for the increasing levels of fallout being detected throughout the world, on March 2 Sen. Frank Church (D, Idaho) proposed that at least an agreed-to ban on atmospheric tests should be sought (W. Post 3/3). Church's proposal is similar to the plan proposed by Sen. Gore last November to the effect that tests which contribute substantial amounts of fallout should be banned. The Senator felt that such an approach would at least avoid a complete collapse of the Geneva talks. At the same time the sincerity of the Russians could be evaluated since they could hardly object to detection techniques which would not require mobile inspection teams.

Plowshare: On Or Off?

The question of whether or not nuclear explosions for peaceful purposes will be permitted within the context of a test ban has not been settled and the Soviet Union had declared itself opposed to excepting them. The AEC, however, has actively been going ahead with preliminary tests, including underground detonations of TNT, for Project Gnome, part of Operation Plowshare. This project, under the supervision of the Agency's Livermore Laboratory in California, is designed to explore the possibilities of deriving useful power from the heat of an underground explosion. In addition, AEC Commissioner McCone has stated that explosions in the Plowshare program, designed to explore peaceful applications of atomic energy, were not precluded by the one year ban of last October (NYT, 2/8). In view of repeated Soviet statements accusing the US of trying to use such explosions as a device to circumvent a test ban it is difficult to see how continuing activity in the Plowshare program can fail to have a decidedly adverse effect on current negotiations.

FAS Release

According to the New York Times of Feb. 9 a ten kiloton detonation near Carlsbad, New Mexico is "tentatively scheduled for next summer." The FAS Executive Committee drew attention to this in its March 3 release. When contacted directly by the FAS Washington Office, the AEC stated that no money has been appropriated and that neither the date nor the location had been selected for an underground nuclear explosion. But it is clear that all of the preliminaries short of the nuclear explosion itself are well underway. Nevertheless, last week retiring Commissioner Willard F. Libby reiterated the AEC policy that no atomic devices would be exploded during the current test ban negotiations in Geneva (W. Post, 3/5).

The March 3 release of the FAS Execom. drew attention to the risks involved in the Plowshare Project by noting: "The US program for peaceful explosions should not be insisted on if it threatens the success of a test-ban agreement. The scheduled nuclear explosions this summer under the AEC's Project Plowshare could very well lead to unrestricted resumption of Soviet weapons tests. No gain from Plowshare would compensate for this unfortunate result."

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Dr. Donald J. Hughes
North Brewster Lane
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**ELECTION OF OFFICERS AND COUNCIL
DELEGATES—FEDERATION OF
AMERICAN SCIENTISTS**

The Chairman and Vice-Chairman are chosen by the entire membership in this election. The remaining officers and members of the Executive Committee are elected by the Council at its spring meeting. Simultaneously with this election, the whole membership annually elects 12 delegates-at-large to serve 2-year terms on the national policy-making Council. The Council is made up of the Chairman, Vice-Chairman, and 2 past chairmen of FAS, one delegate from each of the 8 chapters, and 24 delegates-at-large. Chapters are located at Brookhaven, Chicago, Los Alamos, Los Angeles, Philadelphia, Schenectady-Troy, Stanford and Washington, D. C.
March 10, 1959

Donald J. Hughes, Chairman, Elections Committee

FOR COUNCIL DELEGATES-AT-LARGE

PETER AXEL, Urbana, Ill.—Professor of Physics since 49, Univ. of Illinois. Ph.D. (physics), Illinois, 49. Member staff, Rad. Lab., MIT, 43-46; Bulletin Atomic Scientists, Board of Directors and Sec'y, Educ. Found. for Nuclear Science, Inc. since 53. FAS: Member since 45, Charter member, Illinois Chapter, 50-51; member Nat. Council, 51-52.

DONALD C. BORG, Upton, L. I., N. Y.—Assoc. Scientist & Physician, Med. Res. Center, Brookhaven National Lab, since 55. M.D. (Harvard) 50. Medical House Officer, Boston City Hospital, and teaching fellow in Medicine, Harvard, 50-52; Analysis Officer, Armed Forces Special Weapons Project, Wash. D. C., 52-54. Asst. resident in Medicine, Barnes Hosp, and teaching fel, Washington Univ. (St. Louis), 54-55. FAS: Member since 58.

DONALD G. BRENNAN, Cambridge, Mass.—Mathematician, Math Dept, MIT, since 59. Ph.D. (Math) MIT, 59. FAS: Member since 54; mbr, Visa Cmte, since 54; mbr, Jt Cmte. FAS & Amer Arts & Sci on Tech Prob. of Arms Limitation, since 58; Secy, Boston branch, since 57; author of chptr "Missile Detection" in Meiman's book "Inspection for Disarmament", and similar report for Kitzbuhel confer, Sept 58. (Nominated by petition)

OWEN CHAMBERLAIN, Berkeley, Calif.—Professor of Physics, U. of California, since 50. Ph.D. (physics), U. Chicago, 48. Physicist, Manhattan District, Berkeley and Los Alamos, 42-46; Guggenheim fel, Rome, 57-8. FAS: Member since 53. Treasurer, Berkeley branch, 55; Chmn., Berkeley branch, 56.

GEORGE A. COWAN, Los Alamos, N. Mex.—Assoc. Div. Leader, Los Alamos Sci. Lab. Test Div. and in charge, Radiochemistry Group since 49. D.Sc. (chem), Carnegie Inst. Tech, 50. res. scientist, metal. lab, Chicago, 42-45; Los Alamos Sci. Lab (Calif.), 45-46. FAS: Member since 52; Chmn., Los Alamos Chapter, 55; chapt. del. Nat. Council since 58.

MARTIN DEUTSCH, Cambridge, Mass. — Professor of Physics, MIT, since 45. Ph.D. (physics), MIT, 41. Teach. fel, MIT, 39-41, instr, 41-5; scientist, Calif, Los Alamos, 44-6; civ with OSRD; US Navy, 44; Res. Inst of Physics, Stockholm, 48; Guggenheim fel (Paris), 53-4; consult, Brookhaven and Oak Ridge Labs. Fel, Phys Soc. FAS: chtr mem, Los Alamos chptr, & Boston branch; member since 51; actg chmn, FAS Cmte. on Inter Science since 56, V. Chmn, FAS, 56-7.

HENRY A. FAIRBANK, New Haven, Conn.—Professor of Physics, Sloan Lab, Yale U, since 45. Ph.D. (physics), Yale, 44; With Office Naval Res, 44; staff mem, Los Alamos Lab, 44-46; Guggenheim fel, (Oxford), 53-54; fel, Physical Soc. FAS: Member since 54.

ARTHUR W. GALSTON, New Haven, Conn.—Professor of Plant Physiology, Yale. Ph.D. (botany), U. of Ill, 43. Prof, biology, CalTech, since 51; Guggenheim fel, (Stockholm), 50-51; chmn, meetings committee, AAAS; formerly Sec. and V. P., Amer. Soc. of Plant Physio; prog. chmn, New Haven ACLU, 58-59, mem of Board, 59. FAS: Member since 54; helped organize Los Angeles Chapter.

Identifying Notes on Nominees

FOR CHAIRMAN

HERBERT J. C. KOUTS, Brookhaven, N. Y. — Experimental Reactor Physics Group Leader, Brookhaven National Laboratory, since 50. Ph.D. (physics), Princeton, 52. Assoc. Physicist, Brookhaven Nat. Lab. 50-51, asst. group leader, shielding group, 51-52. FAS: Member, Princeton Branch, 47-50; member, Brookhaven Chapter, since 50; Chairman, Atoms for Peace Committee, since 56.

DAVID R. INGLIS, Western Springs, Ill.—Senior Physicist, Argonne Nat. Lab, since 49. D. Sc. (Physics), Michigan, 31. Instr, Ohio State, 31-4, Asst prof, 34; Pittsburgh, 34-7; Princeton, 37-8; assoc, Hopkins, 38-41, assoc prof, 41-9. fel, Phys Soc, Visiting sci at CERN (Geneva) 57-8. FAS: Member since 46, founded Baltimore grp, 48, Nat Exec, 52-3, Chmn, Disarm Cmte, 52-5, Chmn, Elections Cmte, 53-4.

FOR VICE-CHAIRMAN

CHRISTIAN B. ANFINSEN, Bethesda, Md.—Chief, Lab. Cellular Physiology, National Heart Inst, since 50. Ph.D, (biochem.) Harvard, 43. Asst. instr, Pennsylvania, 37-39; fel, Am-Scandinavian Found, 39-40; instr, Harvard Med. Sch, 43-45; assoc. 45-47; Am. Cancer Soc. sr. fel, Med. Nobel Inst, 47-48; asst. prof, Harvard Med. Sch, 48-50. FAS: mem, Washington chapter. Exec. Bd, 56-58; chapter delegate to Nat. Council, 56-57; member Exec. Comm, and Treas, 57-58; delegate-at-large to Nat. Council 58-60.

ROBERT D. STIEHLER, Washington, D. C.—Chief, Testing & Specif Sect, Nat Bur of Stnds, since 48. Ph.D. (chem) Hopkins, 33. Nat res fel, Caltech, 33-4; Lewisohn fel, Wilmer Inst, Hopkins, 34-6, asst ophthal, 36-8; rubber res, Goodrich Co, 39-42; sr chemist, QM Corps, Boston, 42-3; tech asst, Office Rubber Res, 43-6. Member, AAAS, ACS, ASTM, ASQC; chmn, Rub & Plastics Div, ASME, 59. FAS: Member since 46; chtr member, Wash Chptr, mbr board, 48-51 & current Board, chmn, 49; mbr, Nat Sci Fnd Cmte, 46-51.

EDWIN N. GOLDWASSER, Urbana, Ill. — Professor of Physics, U. of Illinois, since 53. Ph.D. (physics), Calif., 50. Westinghouse fel, Calif, 49-50; physicist, Bur Ord, Navy Dept, 41-45; teaching asst, physics, Calif, 45-49; Fulbright & Guggenheim fel, (Rome), 57-8. FAS: Member since 48, formerly on FAS Passport Committee.

DAVID L. HILL, New York, N. Y. — Executive Security Program, New York, since 58. Ph.D. (nuclear physics), Princeton, 51. physicist and grp ldr, Chicago Met Lab and Argonne Nat Lab, 42-46; prof of physics Vanderbilt, 49-54 (on leave); grp ldr, theor nucl phys, Los Alamos, 55-58. fel, AAAS, Amer Phy Soc FAS: chtr member since 45; Nat Chmn, 53-54; del at large 52-54, chptr del to Nat Council, 57-8; chmn, Los Alamos Chptr, 56-7.

MARVIN I. KALKSTEIN, Sudbury, Mass.—Nuclear Chemist, Nuclear Studies Grp, Air Force, Cambridge Res Cen, since 56. Ph.D. (chem) Chicago, 51. AEC fel, Chicago, 49-51; Asst, Inst. Nuclear Studies, Chicago, 47-9; Res chemist, Rad Lab, Calif, 51-6. Member, Phys Soc. FAS: Member since 51; mbr, Jt Cmte FAS & Amer Acad Arts & Sci on Tech Prob. of Arms Limitation, since 58. (Nominated by petition).

WALTER E. MEYERHOF, Menlo Park, Calif.—Professor of Physics, Stanford U, since 52. Ph.D. (physics), Penna., 46. Prof. of physics, Illinois, 46-49; civ. with Office Sci. Res. & Dev.; fel, Physical Soc. FAS: Member since 1945; co-chmn. FAS Visa Committee, chptr del to Nat. council, 55-58.

DAVID PINES, Princeton, N. J. — Professor of Physics, Princeton, N. J., since 55. Ph.D. (physics), Princeton, 50. Instr., U. of Pa., 50-2; Res. Asst prof, U. of Ill, 52-55; Visiting Prof, Universite de Paris, 57-8; Inst. for Adv Study, Princeton, 58-9. FAS: Member since 46, member FAS Comm. on Loyalty Problems, 49-50; del at large to Nat Council, 55-6.

ARTHUR H. ROSENFELD, Berkeley, Calif.—Professor of Physics, U. of California, since 57. Ph.D. (physics), Chicago, 54. Studied under Fermi at Chicago; co-author of "Nuclear Physics" by Fermi, Orear, Rosenfeld and Schluter. FAS: Chmn, Atomic Scientists of Chicago, 54-5, member, FAS comm. on Public Information, Chicago 53-5, FAS Passport Committee, since 57.

STANLEY RUBY, Pittsburgh, Penna.—Senior Scientist, Rad & Nucl. Lab, Westinghouse, since 56. Ph.D. (Physics) Columbia, 51. Res assoc, Brookhaven National Lab, 51-2; Physicist-Research, Inter. Business Machines, 52-5; Scientist-Research, Kidde Nuclear Lab, 55-6. FAS: Member since 58; mbr, Pittsburgh Branch, Execom & Prgm Chmn.

MATTHEW SANDS, Pasadena, Calif. — Professor of Physics, Caltech, since 50. Ph.D. (physics) MIT, 48. Physicist, Nav Ord Lab, 41-3; Los Alamos Sci Lab, 43-6; res assoc, MIT, 46-8; asst prof, 48-50; Fulbright (Italy), 52-3. FAS: Member since 46, founding member Los Alamos Assn of Scientists.

EDWARD R. SANFORD, Pittsburgh, Penna.—Senior Scientist, Bettis Atomic Power Div, Westinghouse, since 53. Graduate study, Iowa State College. Res Asst, Iowa State Ind Sci Inst, 49-50; Jr phys, Inst for Atomic Res & Ames

Lab, 50-53. FAS: Member since 52, member, Pittsburgh Branch Exec Comm and Chmn, Legislative Committee.

CHESTER M. VAN ATTA, Berkeley, Calif.—Physicist, Radiation Lab, U. of Calif, since 50, Assoc Dir, Livermore since 55. Ph.D. (physics) New York Univ, 33. Asst physics, Washington (St. Louis), 29-30; N. Y. U., 30-33; Nat Res fel, MIT, 33-35, res assoc, 35-8, asst prof, 38-40; physicist, Nav Ord Lab, 40-43; rad lab, Cal, 43-46; prof physics and chmn div phys sciences and math, S. Cal, 46-50. FAS: Member since 54.

VICTOR F. WEISSKOPF, Cambridge, Mass.—Professor of Physics, MIT, since 45. Ph.D. (physics) Gottingen, 31. Res. assoc, Berlin, 31-2; Rockefeller found. fel, Copenhagen and Cambridge, 32-33; res assoc, Inst Tech, Zurich, 22-26; Copenhagen, 36-7; instr physics, Rochester, 37-40, asst prof, 40-43; grp ldr, Los Alamos Sci Lab, 43-7. Vice-Pres, American Phys Soc. FAS: Member since 45, Chmn, FAS Visa Committee, V. Chmn, FAS, 52-3, del at large, Nat Council 53-6.

HUGH C. WOLFE, New York, N. Y.—Professor of Physics and Head Dept, Cooper Union, New York, since 49. Ph.D. (physics) Michigan, 29. Instr, Mich, 27-9; Nat res fel, Caltech, 29-31; Lorentz Found. fel, Utrecht, 31-2; instr, Ohio State, 32-3; prof of physics, City Col, 34-49. Assoc. Ed, Am. Journ Physics, since 54; Tech aide, Office Sci Res and Dev; Nat Def Res Cmt; fel, Amer Phys Soc; Nat Exec. Commit. SANE. FAS: Member since 45, Nat. Chmn, 49-50, V. Chmn, 50-1, Treas, 53-4, del at large, 52-6; N. Y. Branch Sec, since 55, V. Chmn & Actg Chmn, 58.

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