

F. A. S. NEWSLETTER

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EARTH TREMORS: HERE AND ABROAD

The prospects for achievement of a test ban agreement remain doubtful. The communiques from Geneva vacillate daily between hope and despair, the conference apparently being deadlocked now on the question of veto power and on-the-site inspection.

The Soviets want any agreement to contain the right to veto over all decisions of the detection agency fearing that the four "neutral" nations seated on the commission will be pro-West. Particularly unacceptable to the West, the Russians insist that all proposed on-the-site inspections be subject to veto, claiming that these could be cover-ups for espionage. They state that if sufficient reason exists for an on-the-site inspection, world opinion would prevent the veto. The US position is that no inspection system can work unless the inspectors can freely inspect, and that the technical decision of the necessity of an on-the-site inspection is not one to be made by anyone other than the competent inspection teams.

On the domestic scene the reliability of the detection system devised by the Geneva Conference of Experts continues to be debated. The White House report based on the October '58 test series, including less resolution by seismic detectors between earthquakes and underground nuclear explosions than was thought to be available at the time of the Geneva technical talks, and the subsequently released Defense Department statement (1/16) have elicited many and varied responses. The reasons behind the timing and method of the initial release of the data have also been questioned in view of the fact that test ban talks were in progress.

Humphrey's Speech

The information available as of January 20th was presented in the speech Senator Hubert Humphrey gave to the Senate on that day (see *Science*, Feb. 6th). Senator Humphrey states unequivocally that the new data presented are genuine, not "created" by Dr. Teller or anyone else, but that the inference from the data that a test detection system is not possible or feasible is invalid. The data, he said, showed that with the control system devised at the Geneva Experts Conference it would be more difficult to distinguish between nuclear explosions and earthquakes. However, he emphasized that there are those who feel that by the use of new techniques, now under study by a special panel of the President's Science Advisory Committee, capabilities of a detection system may be improved without increasing the number of detection sites originally recommended.

The discussion of the new data, as Senator Humphrey explained, is centered around two inter-related issues: 1) that the signal from an explosion of a given yield is weaker than had been anticipated on the basis of the Rainier test, making more likely that such explosions could be confused with earthquakes and 2) that the weaker signal is more easily confused with background noise making it more difficult to identify explosions on the basis of the direction of the initial deflection. (See Jay Orear's article in "Inspection for Disarmament", Ed. by Seymour Mellman, Columbia University Press, 1958).

After discussing the new data in detail, the Senator went on to say that relatively minor changes in the detection system, (e. g. sinking the seismographs' "pick-ups" deeper into the ground to decrease background noise; increasing the number of "pick-ups" per station to increase sensitivity, etc.) could bring the level of reliability of the originally planned system back to that estimated by the Geneva Conference of Experts, if not higher. Further, although this was not in the White House or Defense Dept. releases, the new data has suggested at least one new method for distinguishing earthquakes from explosions: comparison of the

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MISSILES AND DEFENSE

The balanced budget presented to Congress by President Eisenhower includes 41 billion dollars for the Department of Defense. An annual increase of 3% in the defense budget is needed to meet price inflation, whereas the amount requested in the 1960 budget is only ½% more than that in the 1959 one. The President declared however, that his program gets "maximum defense from each dollar". (*Wash. Post*, 1/20).

The budget message emphasized that 800 million dollars more would be spent next year on missile production and research but failed to point out that this money had already been appropriated by the last Congress. Examination of the budget reveals that a total of 3.5 billion dollars is being requested for missile production as compared with 4.1 billions for the same purpose in the current fiscal year. The reduction was explained at a Pentagon budget briefing as resulting from a lower volume of missile orders and an elimination of "marginal" missile programs. Inquiries about the status of the additional 800 million dollars for Polaris submarines, missiles, and aircraft appropriated by the last Congress and immediately "frozen" by Defense Secretary McElroy, revealed that none of it has yet been released for spending but that all will be used during the next 18 months. An editorial opinion in the *Washington Post* of Jan. 20 characterized the new budget as follows: "The President in effect is saying to his countrymen, 'Go buy a new TV or a new car or a new hula-hoop whether you need it or not. To give you confidence, I'll see that your money isn't wasted on things you want more but can't buy for yourself.' This is a prescription for private bloat, public stagnation and general peril, and we hope the country will not be made to swallow it."

Pentagon missile officials, testifying before the Senate Preparedness Subcommittee, stated that Administration spending cuts are holding back key development programs. Herbert York, Chief of the Advance Research Projects Agency, told the Senators that a 30% cut in his budget has delayed the development of a 1.5 million pound thrust engine urgently needed to catch up with the Russians. Werner Von Braun, the Army's ballistic missile expert, testified that Russia still holds a five year lead over the U. S. and that he is not sure whether we are losing or gaining ground. William M. Holaday, Pentagon missile director, revealed that the Administration had turned down his recommendation that additional Polaris submarines be built in 1959-60. These men all urged that additional funds be provided in the 1960 budget. (*Wash. Post*, 1/31).

U. S. vs. Soviet Missile Strengths

An alleged statement by Vice President Richard Nixon, that he believes the U. S. to be ahead of Russia in the missile field opened the way for Senate hearings on the present status of the U. S. missile development programs. The hearings will be conducted jointly by the Senate Space Committee and Defense Preparedness Committee, both chaired by Senator Lyndon B. Johnson. The accuracy of the Vice President's statement was challenged by Senator Stuart Symington, and friends of Nixon replied that his actual position is that this country is developing missiles at a rate which will enable it to catch up with Russia.

President Eisenhower, at a National Press Club luncheon, offered the opinion, "that we would be more than a little stupid not to believe that Russia is outstripping the United States in some phases of missile development". (*Wash. Post*, 1/15). This exchange of general views was followed by a news conference on January 22 held by Secretary McElroy during which he gave detailed answers to questions on

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A-BATTERY TURNS ON HEAT

A small nuclear-powered generator was demonstrated to President Eisenhower on Jan. 16 by AEC Chairman John McCone accompanied by considerable publicity. The device, called SNAP III, produces about 3 watts of electricity on the average by thermoelectric conversion of the heat released by one-third gram of radioactive polonium-210. It is a prototype unit to show the feasibility of light-weight power sources.

Possible hazards were not mentioned by the AEC at the time, but Ralph Lapp wrote to the *Washington Post* (1/21) pointing out that "the power source placed before the President contained 10 billion lethal units of polonium." He noted that such a device if ruptured, as might result from the return of a nose cone to the earth, would create a substantial hazard, and proposed establishment of a "police group" to insure that our ventures into space do not leave radioactive residues to contaminate the earth people."

A number of omissions cloud the original AEC announcement, which claimed SNAP III to be a "highly significant achievement." The statement claimed that "the concept of SNAP III was developed in four months . . . under a \$15,000 contract." It failed to mention that work on earlier versions of SNAP (Systems for Nuclear Auxiliary Power) began in 1952 or 1953, and that the principle of thermoelectric power generation was pioneered by Russia.

The unit displayed at the White House was about 5 inches in diameter and weighed 5 pounds. It was charged with 1500 curies of Po-210, which has a 140 day half-life. The device converted heat into electricity with an efficiency of 5-6%. In quantity production for rocket applications the unit could be reduced to 3 pounds, and its cost would be greatly lowered, said the AEC. Apparently SNAP III will not be made in quantity. Instead another device, SNAP I, which uses high pressure gas to drive a turbine (W. Post 1/17) will be produced. According to Chem. and Eng. News (1/26), SNAP I "will power the television-type scanner in the U. S. Sentry . . . reconnaissance satellite." The fuel used in SNAP I will probably be cerium-144, which costs about 7c per curie compared with \$10 per curie for Po-210 (W. Post 1/17).

A-POWER AT HOME AND ABROAD

There is hope that the year 1959 will see great advances in the peaceful use of atomic energy both at home and abroad. A proposed Agreement for Cooperation with Euratom was signed last November, after authorization by the Congress and the agreement was formally submitted to the Joint Committee on Atomic Energy on January 14. This means that the agreement will become effective on February 13, 1959 unless Congress now enacts disapproving legislation. The United States will thus be authorized to spend 3 million dollars for research and development for the Euratom project during the current fiscal year. In addition, Congress has authorized the AEC to sell nuclear fuel to Euratom. The six nations in the Euratom project are France, West Germany, Italy, the Netherlands, Belgium and Luxembourg. These nations hope to obtain one million kilowatts of electric power from atomic energy by December 1963.

Private vs. Public Control

On the home front, the struggle for private versus public control of atomic energy for electric power appears to be easing up. The crux of the long-time struggle is the extent to which the government should aid private industry in the development of technology for production of electric power from atomic energy. The public power proponents and the leadership of the Joint Congressional Committee on Atomic Energy have objected strenuously to government support of development of power plants that ultimately would be turned over to private industry. Private industry, on the other hand says it does not want to take the risk involved in research and development. So far industry has had the AEC and President Eisenhower on its side. With the departure of Adm. Strauss from the AEC, the situation has eased somewhat and there are indications that cooperation between government and private industry may be achieved. The Philadelphia Electric Company together with some 50 associated private utilities have announced that they will build a 39 million dollar, 30,000 kilowatt reactor. The government is being asked to contribute 14.5 million for research and development. This may mark the beginning of fruitful cooperation between government and industry.

EARTH TEMORS (continued from page 1)

distributions of energy among the various types of waves generated by an event.

Finally, Sen. Humphrey discussed the risks involved in negotiations and a test ban agreement. After warning the Soviets that we must have a workable detection system which has provision for improvement should flaws be discovered, and that we cannot agree to a system which can hamper on-the-site inspection where necessary, the Senator closed by pointing to the advantages of a test ban, stating emphatically that "Failure (of the negotiations) must not be charged to us (the West). We must continue to negotiate to see if an agreement can be reached."

Seismographs Under Study

Seismologists, however, have not reached unanimity among themselves concerning the possible improvement of the detection system devised at Geneva. Earl Voss in the *Washington Star* (2/8) reports that some seismologists feel it may take two years and require a good deal of testing of instruments—by atomic explosion in some cases—before a test detection system could be sufficiently examined to be approved. Further, Mr. Voss points out that heavy reliance on on-the-site inspection may not be practical, since the pinpointing of an explosion by seismic means is not very accurate and evidence of an underground explosion can be meager at the surface. He said the test detection system, as planned in Geneva, does not detail the methods that on-the-site inspection teams should use. Improvements in seismic detection methods are currently under study by a panel of the President's Science Advisory Committee headed by Lloyd V. Berkner.

Public Opinion

Concerning the reasons behind the release of the White House statement, E. Gamarekian in the *Washington Post* (1/24) charged that the President's Science Advisory Committee gave out the information to avoid being "scooped". "Someone had 'leaked' the information to *Time* . . ." I. F. Stone's *Weekly* (1/12) strongly suggests complicity among the anti-test-ban groups to scuttle the Geneva negotiations. The *Washington Post* entitled their 1/7 editorial "Nuclear Underground". Nevertheless, inquiry by the FAS office of informed sources in the Washington area, has unearthed no direct evidence of collusion, but has found rather that the prevailing opinion is that improper release of material—in view of the negotiations in progress at Geneva—coupled with poor and inadequate press coverage yielded false impressions which led to questionable conclusions.

SCIENCE AND EDUCATION

Bills introduced by Senator James E. Murray (D, Mont.) and Rep. Lee Metcalf (D, Mont.) would provide federal grants for primary and secondary schools on the basis of each state's school-age population. For each school-age child \$25 would be appropriated during the first year of the bill (1959-1960), \$50 for the second year, and \$100 for each year thereafter. The funds can be expended by the states for school construction and teacher's salaries. States that did not spend as large a proportion of their population's total personal income for education as the national average would receive less per year, with the amount deducted to go to the states spending a greater portion of their total personal incomes for education. This part of the law would not be enforced during the first three years.

The bill contains assurances that no federal intervention into the educational policies of the separate states would result from these programs.

Drop In Enrollments

Secretary Flemming of the Department of Health, Education and Welfare reported that, after a steady, seven year rise in freshmen enrollments in engineering schools to a high of 78,757 in 1957, enrollment fell to 70,129 in 1958, a drop of 11 per cent. The Secretary expressed concern over this reversal of a previously encouraging trend.

A total of \$5.48 billion dollars was requested in the President's budget for government research and development programs. About two thirds of this sum is for research and development in weapons and defense; this represents a slight increase over the current year to meet rises in costs. A great increase was requested in the funds allotted for space exploration. The sums for atomic research were held to the level of last year's requests. The budget cuts the \$225 million requested by the National Science Foundation to \$160 million.

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missile development. He said that he does not believe the Russians have an ICBM that could hit the U. S. and that there is no positive evidence that they will have an operational ICBM before we have one. (Wash. Post, 1/23). These statements were also challenged by Senator Symington, on the Senate floor, when he stated that intelligence figures show that Russia will have four times as many ICBMs as the U. S. by 1961 and suggested that the Secretary's statements were made "primarily to support a restricted budget position". (Wash. Post, 1/24).

It is against this background of generalizations and private interpretations of intelligence data, that the Senate hearings will try to determine if the United States is doing everything it reasonably can and should do to insure the defense of this country and the Free World against military aggression.

Los Angeles Chapter Critical

A press release from the Los Angeles Chapter of F. A. S. on January 3, 1959, touches on an aspect of missile development which is more or less omitted from the debates going on in Washington: "... more than a year after Sputnik I, the nation is as far from a practical, operating, unified space technology agency as ever; interservice rivalry in missile development is as great as ever; and the administration continues to blame the superiority of Russian education for our terrifying situation, instead of accepting its clear responsibility to streamline the defense organization and to eliminate the current widespread inefficiency of extravagant cost-plus missile contractors."

RADIATION LEUKEMIA STUDY PROPOSED

A multi-million dollar 20-year study of the relation between radiation and cancers was proposed on January 6 by Dr. Shields Warren, chairman of the Committee on Pathological Effects of Radiation set up by the National Academy of Sciences-National Research Council. The proposed study would analyze the incidence of leukemia and other cancers in two cities such as Denver and San Francisco. Denver's higher altitude gives it twice San Francisco's background radiation rate, so the study would presumably reveal the connection between radiation dosage and cancer.

The plan has been questioned by a number of persons according to an article by Edward Gamarekian in the W. Post (1/21). They point out that a study in 1947-48 showed that San Francisco had a higher incidence of leukemia and bone cancer than Denver, in spite of the higher background radiation in Denver. But other cities covered in the 1947-48 study showed a lower cancer incidence than Denver. Opponents of the proposed study contend that the choice of San Francisco may bias the results.

Some members of Warren's committee expressed surprise at the announcement, according to Gamarekian. They said it was to have been discussed at a meeting early in February, and that Warren's announcement was premature.

The Pathological Effects Committee also released comments which questioned some of the U. N. Radiation Committee conclusions about the incidence of leukemia and other cancers and their relation to radiation dosage.

OUTER SPACE REPORT

A final report rendered by a special Space Committee of the House of Representatives concluded that there is a perilous lag in the development of a US space program. They were informed that even with the 7 billion dollars being spent on the missile program this year, it would require an additional effort for 5 years to match the Soviet missile program. It was also stated that the space program would advance faster "without the shackles of an undue security control". A critical review of science education in the United States was thought to be necessary in order to establish the stress on mathematics and science courses that was essential to an appropriate missile program.

The new Congress immediately plunged into its own inquiries. Mr. Keith Glennan, head of the National Aeronautics and Space Administration informed the Senate Space Committee and Preparedness Committee that in four years the capability would exist to push 75 tons into orbit and

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UNIVERSITIES OBJECT TO LOYALTY OATHS

Officials of several of the country's leading colleges and universities, including Harvard, Yale and Wisconsin, have protested the loyalty oath requirement of the National Defense Education Act. The same criticism was also voiced by the Secretary of Health, Education and Welfare, Arthur S. Flemming (W. Post, 12/16), by the American Association of University Professors, and the Association of American Colleges. Persons receiving funds under the Act are required to sign an 'anti-subversion' affidavit as well as an oath of allegiance.

Flemming pointed out that subversive individuals "have no scruples about signing such an affidavit and taking such an oath". Robert F. Goheen, President of Princeton University, objected to the loyalty oath because it "raises a presumption of the lack of confidence in the people doing the signing" and he termed the measure an "indignity" (NYT, 2/4).

Courtney C. Smith, President of Swarthmore College, in announcing that Swarthmore would not participate in the student-loan program unless the anti-subversion measure was repealed, said that Swarthmore is opposed to requiring any commitment from students as to belief or disbelief (NYT, 2/8). Other institutions which will stay out of the loan program because of objections to the loyalty oaths include Haverford, Bryn Mawr and Princeton. Senator Robert F. Kennedy (D, Mass.) has introduced a bill to terminate the loyalty provisions (W. Post, 2/1).

OUTER SPACE (continued from previous column)

thereafter land a man on the moon. On the basis of the Soviet Lunik's performance, Glennan told the committee that the Soviet's intercontinental missile could strike at targets in this country with a 15 to 20 mile circle of error.

The overall program of putting a man in space called Project Mercury was initiated with the announcement that the McDonnell Aircraft Corporation was selected to develop the vehicle at an approximate cost of \$15,000,000. In addition 110 men were chosen as possible space men and were going through screening to reduce the number to 12 by March.

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, Lee Herzenberg and M. Singer; Writers, R. Glasser, H. Goldfine, Lee Herzenberg, S. Rothberg, E. Shelton, M. Singer, F. Stern and B. Stiller; Production: I. Shapiro, of the Washington Office Staff.

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NATIONAL DISARMAMENT CONFERENCE

The sixth National Conference on World Disarmament and Development, with FAS one of the 20 sponsoring organizations, took place in Washington, D. C. Jan. 23-24. The conference aim was to focus attention on some specific issues in the disarmament field and their relationship to world economic development.

Sen. Hubert Humphrey (D, Minn.), principal speaker at the afternoon session said that the United States should continue with the Geneva talks on banning nuclear tests until "they are successful or until it is abundantly clear the Soviets will not accept the fundamental requirements of a control system."

In an evening session, Socialist leader Norman Thomas called for "a tremendous effort for security through mutual disarmament under a strengthened United Nations and disengagement from the kind of alliances which make war by design or accident so much more likely than peace."

Prof. Seymour Melman of Columbia University and editor of "Inspection For Disarmament" (also an FAS member) stated that nuclear bombs can now be smuggled in suitcases and that there is therefore no defense against the destruction of cities and vital areas. Such devices can be triggered by remote control and may already be planted in the principal cities of the world, he warned. Melman emphasized that any disarmament agreement "would . . . help to curtail the atmosphere in which massive destruction of human life is regarded as a reasonable act, and secret preparations for this purpose are accepted as morally proper behavior."

Fred Singer, University of Maryland physicist and an authority on space research argued that a workable agreement on disarmament with the Soviet Union did not appear possible at the present time. Both Melman and Singer were members of the panel on "Inspection: The Deepening Problem". The entire panel took a pessimistic view on the feasibility of a foolproof disarmament system.

Influencing Public Opinion

In the Round Table discussion: Public Opinion on Disarmament, there were two points of special interest to FAS members on the subject of influencing public opinion: 1) Fifty letters from constituents are sufficient to highly interest and possibly sway a congressman on a given issue and 2) Many religious and social organizations actively support disarmament as part of their national organization program, and that on this basis, members of these organizations can frequently be interested in getting up discussion groups and educational meetings, so that more and more people can be made aware of the immediate problems and the far-reaching consequences of disarmament. For example, the organizations sponsoring this Disarmament Conference include American Veterans Committee, Council of Liberal Churches, National Federation of Temple Sisterhoods, United Church Women and the Council on Christian Social Progress of the American Baptist Convention.

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THE PROBLEM OF RADIOACTIVE WASTE DISPOSAL

Any reactor, in partially converting the mass of fissionable fuel elements into thermal energy, produces as well large amounts of radioactive byproducts. These ashes are composed of both fission products and transuranic elements and have a composition not greatly differing from fallout. As the number and size of reactors grows, particularly the high power level reactors for power production, the problem of disposal of these wastes increases. The Holifield Subcommittee of the Joint Committee on Atomic Energy held five days of hearings on this topic which began on Jan. 28. As a result of the hearings, both Rep. Holifield (D, Cal.) and Rep. Hosmer (R, Cal.), called for clarification of responsibility for the safe disposal of industrially produced radioactive waste. At present the state health departments, the US Public Health Service, and the AEC have partial and in some respects overlapping jurisdiction over this area. (Wash. Post, 2/4).

The Next 40 Years

The magnitude of the problem can be gauged from current estimates of the amount of nuclear power production over the next 40 years. These figures indicate that by the year 2000, there will have accumulated 6 billion curies of strontium-90 alone. The so called maximum permissible body burden for whole populations is only 0.1 microcuries for an adult individual.

Present methods of dealing with wastes, while adequate for the rate at which we are presently producing them are not at all satisfactory over a long period. High level wastes are stored in above ground tanks. In addition to the expense of these, the danger of leaks is not absent and since some of the isotopes have long half lives, wastes will still be quite hot a century from now.

Lower level wastes are run into the ground. The main hazard is such disposal results from the lack of knowledge of subsurface water flow patterns. Careful monitoring and maintenance of high safety factors probably make this a safe method for the present.

Future Storage Methods

Projected future methods of storage, including solidification and storing in brine wells, are all still in exploratory stages. Whatever solutions are arrived at, present estimates are that they will be quite costly and thus add to the cost of nuclear power production. This makes attractive the possibility of using the wastes themselves for their energy in devices such as radioactive batteries. While the costs of processing for this purpose would be considerable, if some of these costs are charged to waste disposal such units might be economical for some uses. (See Wallace de Laguna, Bull. At. Sci. Jan. '59 for a good review of the waste disposal problem).

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