

F. A. S. NEWSLETTER

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February 23, 1956

RADIATION HAZARDS

The available facts on the hotly debated problem of "Genetic Effects of Fallout" have been pulled together and their implications examined by several members of the FAS Cambridge Branch. Their report, submitted to the FAS Council at its New York meeting on Feb. 3, is summarized below. At the Council's request, the FAS members who prepared the report will constitute an FAS national committee on radiation hazards, consisting of: L. S. Osborne, chairman; H. Epstein, F. Selove, W. Selove, and R. Weinstein.

The Cambridge group first began collecting information on radiation effects about a year ago. The principal objective was to facilitate wider understanding concerning the extent of any immediate danger associated with the continuation of large-yield weapons tests. The viewpoint taken was that of investigating the effects if the "present" rate of testing should continue for 5 to 10 years; the question of the effects of testing for a longer period can be more adequately evaluated, should the necessity exist, when the results are available from the much more complete surveys currently underway by the United Nations and the National Academy of Sciences committees.

SOURCES OF DATA This report is devoted primarily to the genetic effects of the radiation from fallout, since a rough survey indicates that other effects -- for example, direct biological damage -- are of lesser magnitude than the probable genetic effects. The data on which the conclusions of the Cambridge group are based are available largely in a few recent issues of the *Bulletin of the Atomic Scientists* and of *Science*. Use was made of the articles and estimates of H. J. Muller, S. V. Neel and W. J. Shull, H. B. Glass, H. M. Slatis, and R. E. Lapp. Valuable information was also obtained from AEC statements and data available in unclassified publications.

There are two important general aspects of the genetic effects of radiation: (1) Long-range cumulative effects, and (2) numbers of individuals affected. While there is still obvious
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CONTROLS IMPEDE A-USE

A report entitled "Peaceful Uses of Atomic Energy" was issued on January 31, culminating a 10-month study by a panel appointed by the Joint Congressional Atomic Energy Committee. Under the chairmanship of Robert McKinney, publisher and editor of the *Santa Fe New Mexican*, the panel generally recommended relaxation of centralized controls and the encouragement of a wider participation of private groups in the development of the peaceful uses of atomic energy.

6 AREAS STRESSED Specific recommendations were made in six areas: (1) Atomic power - If necessary, the report recommended that the AEC construct "one full-scale demonstration plant of each major reactor size and type" as a means of encouraging participation by private industry. (2) Controlled thermonuclear power - Within security limitations, the AEC should "permit the maximum interplay of scientific and engineering ideas" as well as making available to the public sufficient information about the possibility of power from nuclear fusion to guide financial investments. (3) Medicine and public health - Wide expansion of training and research facilities and the means for the dissemination of the results of medical research. (4) Agriculture - Renewed research aimed at increasing farm productivity as a means of aiding undernourished countries. (5) and (6) Maintenance of present levels of research in connection with food preservation with radiation; and an investigation of the economic feasibility of atomic powered ships.

DECLASSIFICATION RECOMMENDED Generous support of research in universities and private research centers both here and in friendly countries abroad was recommended to insure the continued advancement of fundamental knowledge in the nuclear field. Such support might include the provision of technological assistance and nuclear fuels to allow for the installation outside the US of at least one million kilowatts of atomic generating capacity by 1960. The report
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F. A. S. - - T E N T H A N N I V E R S A R Y

On February 5th, FAS completed its first decade -- a decade in which the world has faced and grappled with an awesome array of grave and complex issues. When these issues have been particularly relevant to science and scientists, FAS has earnestly endeavored to understand and to clarify, to state the views of the scientist -- both as scientist and as citizen -- that they might be weighted by those responsible for decision. The record will show how real and useful the contribution of FAS has been.

"... This debate should not pass without a tribute's being paid to the efforts of the Federation of American Scientists. It may well have been the Federation's proposal, made public on 6 March last, which for the first time anywhere specifically suggested a United Nations commission to study and assess the radioactive contamination resulting from atomic bomb tests. So far as I know, this proposal was made before any government anywhere had espoused such an idea. The Federation of American Scientists, therefore, should be commended for its initiative in this regard.

"If, indeed, the scientists thus inspired the thinking of governments here and elsewhere, let this debate underscore once

again that the peoples' voices can be heard in the United Nations.

"The peoples speak, and democracy works. The United Nations and our governments back home listen to the peoples. We want their hopes; we want their thoughts. Diplomats too often become deadlocked. Let the peoples' thinking help us to break the deadlock. ..."

-- Carlos P. Romulo, former President of the UN General Assembly, speaking before the United Nations, November, 1955

Report on RADIATION HAZARDS

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disagreement on the exact magnitude of these hazards, prominent geneticists have given independent estimates narrowing the range of uncertainty to a factor of 10. Much of the apparent disagreement results from the differing terms in which the results are presented.

CUMULATIVE EFFECTS The human race already carries a certain number of deleterious mutations. These are added to by spontaneous mutations and decreased by deaths of seriously affected individuals who have not reproduced. It is estimated that a 10% increase in the overall number of deleterious mutations would require over 1000 years of testing at the rate of 50 megatons fission yield per year. (Roughly this amount of yield appears to have been involved in the 1954 tests by the US and Russia. All the previous years of testing put together probably totalled less.) Thus such a testing level involves a vanishingly small long-range genetic hazard, at least on a percentage basis.

NUMBER AFFECTED The number of individuals affected may be stated in several different ways. If again we consider the effects of the world-wide fallout from 50 megatons of fission yield in tests, then the most probable magnitudes of the effects may be described as follows: (a) It may be expected that the offspring appearing in the following years will include a certain small number of mutations so deleterious as to cause death and in the process disappear from the population. This number will be of the order of 100 per year for the US and 500 to 1000 per year world-wide. (b) This number is equivalent to one seriously affected offspring in about 50,000. (c) The effects of this amount of testing will continue to appear for a very long period, eventually affecting some hundreds of thousands of people. (d) Stated in terms of percentage increase over the number of mutations appearing due to other causes, the effect of fallout is very small. 50 megatons of fission yield from tests will produce in the next generation an effect amounting to an increase of only one part in 1000 over the uncontrollable natural spontaneous mutation rate. For comparison, it should be noted also that the average genetic effect of X-rays, at the current rate of medical use, is in each year about the same as, or perhaps twice as much as, the genetic effect from fallout resulting from this amount of testing. This rate of X-ray exposure has existed, of course, for many years.

These estimates have been given for the effects of 50 megatons of fission yield from tests. While the radiation from this amount of fission yield decays relatively quickly, the genetic effects unfold over many years and will be cumulative. Thus, for example, if one year's tests amount to this yield and produce, world-wide, in the next generation 30,000 heavily affected individuals, representing an increase of one part per thousand over the spontaneous rate, then 10 years' tests at this level will produce 300,000 heavily affected individuals, corresponding to an increase over the spontaneous rate of 10 parts per thousand.

MARGIN OF ERROR It should be realized that the magnitude of the effects cannot be known precisely from the presently available data. The final numbers involved, for the effects discussed above, are agreed on by a number of geneticists to within a factor of 10 either way, but these are not absolute limits. The correct numbers are simply not known and the estimates may be in error by even more than this factor of 10. But at the same time it should be noted that one of the most respected geneticists, H. J. Muller, attaches to his final estimates of radiation effects a probable range of uncertainty rather smaller than this.

The exact mechanisms by which a mutant gene affects human beings are also subject to great uncertainty but would probably include organic troubles in the form of disease, susceptibility to disease, and pre-natal death. The effects in terms of human suffering cover a wide range, from tragic to unnoticeable; moreover, one mutation can manifest itself over many generations before disappearing.

HOW SERIOUS ARE EFFECTS? Suppose we consider the effects of a year's testing at the rate of 50 megatons fission

yield. The number of offspring seriously affected as a result will then be about 100 a year for a long period; or within the uncertainty given, 10 to 1000. These numbers are for the US; the world-wide effect is about 10 times larger. Do these numbers constitute a "large" effect, a "small" one, or a "negligible" one? The Cambridge group offers the following conclusions on the matter.

CONCLUSIONS "As individuals we are sensitive to the value of the individual, and from this viewpoint the number affected can hardly be called negligible. At the same time, to make a just evaluation as to the seriousness of the effects, it must also be recognized that the effects of weapons tests at the present level do represent only a negligible percentage increase in the number of mutations carried by the human race.

"Compared to all the health hazards which man's present form of living inflicts on man (e.g., medical X-rays, smog) one can make an effective argument to the point that this additional effect from weapons tests is really a small effect, and if we want to make a large improvement in the overall matter of health hazards we might well concentrate first on some of the larger effects -- for example, on the rather larger effects resulting from the use of medical X-rays at the current rate.

"The question of whether a government or a people can properly continue to conduct tests in view of the resulting genetic effects can be answered only on balance against the reasons for continuing weapons development. Regardless of one's position in this respect, however, the first requirement for meaningful discussion is the understanding of the magnitude of the effects. The available data do indicate the probable magnitude and any governmental decisions and statements should be made with clear understanding of this number.

"Although, as the AEC has stated, the amount of radiation exposure from all nuclear weapons tests to date is very small in comparison to the radiation received from natural sources (not to mention medical X-rays), and although the magnitude of the deleterious effects of nuclear tests must be judged also in the light of the presumed advantages of continuing weapons development, we would suggest that it is misleading for the AEC to call effects of weapons tests "negligible" on the grounds that they constitute a statistically undetectable increase in the normally occurring spontaneous rate of mutations. 100 seriously affected offspring per year may indeed be a statistically undetectable increase in the 100,000 or so 'normal' serious deleterious mutations appearing each year among the over 4,000,000 births in the US. But a certain number of individuals is involved; and the number may be not 100 (world-wide, 1,000) but 10 times that large. Although these numbers represent only a small percentage increase over natural effects, we feel they are large enough to be given weight in making policy decisions regarding nuclear tests."

PERSPECTIVE ON HAZARDS Perhaps the most meaningful and understandable way of putting the magnitude of the fallout radiation hazard in perspective is to compare it with less discussed radiation sources to which we are continually exposed. The average dose from cosmic rays and other natural sources is about 100 milliroentgens per year. A typical luminous-dial wrist watch delivers to the gonads a yearly dose of the order of 5 to 20 mr. The average US citizen receives 100 mr annually from medical use of X-rays, according to S. H. Clark (Bulletin of the Atomic Scientists, Jan., '56). The Cambridge group estimates an average annual dose of 20 mr. These figures should be compared with the 10 to 30 mr time-integrated dose per individual resulting from 50 megatons of fission yield in weapons tests.

It would appear then that use of medical X-rays is responsible for a considerable number of deleterious mutations. In addition to their genetic effects, and of more immediate importance, some diagnostic X-ray exposures are intense enough to be decidedly hazardous in terms of skin burns or radiation sickness. Relatively simple precautions and modifications in procedures are available, but legislation or regulation may be necessary in some cases to insure their adoption. In any case, it is clear that there are very real sources of genetically damaging radiation other than fallout.

PASSPORT PROCEDURES PONDERED

The State Department has until recently been avoiding a passport showdown in the courts because of its weak position in the first few suits filed against it. During the last six months, at least a dozen passports have been granted after legal action was instituted, and apparently passport denial to persons accused of Communist affiliations now requires evidence of serious involvement with the Communist movement. Now under controversy is what constitutes acceptable evidence for such involvement, and whether the government must reveal the evidence.

BOUDIN CASE The Justice Dept. appears now to have chosen the case of New York attorney Leonard B. Boudin to test these questions. Boudin's passport was refused on the grounds that he has been and continues to be an active supporter of the Communist movement; he has denied present membership in a sworn affidavit. Boudin claims that the constitutional guarantee of due process requires the State Dept. to reveal the evidence against him so that he may have an opportunity for rebuttal. The government argues, as it has consistently done in all security matters, that it cannot reveal its evidence without revealing sources of information which seriously weaken its investigative methods. The case is now at the Appeals Court level. The Court has been unsuccessful in obtaining details from the State Dept. concerning the sources of derogatory information about Boudin. Whatever the outcome, the case will probably be reviewed by the Supreme Court.

OTHER CASES Other passport cases to receive attention last month were those of screen writer Carl N. Foreman and cosmic ray physicist Bruce Dayton. Foreman is an admitted ex-Communist who appeared as an "uncooperative witness" before the House Un-American Activities Committee in 1951 and who lost his passport in 1953. He filed suit last September to regain the passport and, in January, the State Dept. reversed itself and returned his permit to travel.

Dayton was linked by the State Dept., in a circumstantial way, with persons suspected of being involved in Communist espionage. He denies the charges made against him, but was refused a passport to India in order to work with Bernard Peters at the Tata Institute. The fact that the State Dept. already regarded Peters with suspicion did not help Dayton's case. Dayton filed suit to force the issuance of his passport on the grounds that due process had not been followed. District Court Judge McGarraghy ruled last month that the State Dept. is not required to reveal the evidence on which the passport refusal was based. Since this ruling is in direct contradiction to an earlier one by Judge Youngdahl in the Boudin case (see NL 56-1), there will certainly be an appeal by Dayton.

APPEAL USE EXTENDED The State Dept. has been criticized on the grounds that its procedures were paradoxically giving privileges to Communists in that they may appeal passport denials. On Jan. 12, the Department announced extension of its current appeal and hearing procedures to cases which do not involve charges of Communist involvement. The basic issues of procedure and of the underlying power of the Secretary of State to refuse passports remain unchanged and are being challenged in current court actions.

NSF FOREIGN TRAVEL FUNDS

In an editorial in Science (Jan. 27), the AAAS reminds the scientific public that the time is approaching for the annual consideration of the National Science Foundation foreign travel grant appropriation by Congress. The editorial points out the seriousness of the handicap placed on American scientists and on the US scientific effort by the complete deletion of these funds from last year's NSF budget. It contrasts this situation with that existing for other nationally representative groups, such as members of Congress, and for such cultural groups as the cast of Porgy and Bess. As suggested by the FAS before last year's budget cut, an expression of views by letter or wire is now in order. (Address Sen. Carl Hayden and Rep. Clarence Cannon, chairmen of the Senate and House Appropriations Committees, respectively, Senate or House Office Building, Washington 25, D.C.)

CIVIL LIBERTIES AT ISSUE

Recent months have seen more emphasis on individual rights and less on 'security at all costs.' However, abuses continue and the courts have yet to rule unequivocally on the problem of security and the rights of the individual.

PURE EXPOSURE The US Court of Appeals in Washington announced Feb. 20 that its full bench of 8 judges would reconsider the contempt of Congress case against John T. Watkins, Rock Island, Illinois labor organizer. This case involves the important question of the right of Congressional committees to expose past Communist affiliations purely for the sake of exposure. In a 1954 House Un-American Activities Committee hearing, Watkins revealed his own Communist affiliations and was willing to talk about persons he believed were still Communists, but, without using the 5th Amendment, refused to discuss people who he believed were long removed from Communism.

Watkins' earlier Federal District Court conviction of contempt of Congress had been reversed on Jan. 26 by a 3-judge panel of the appellate court which ruled 2-1 that "In order to convict, the Government must plead and prove that the questions the witness would not answer were pertinent to an inquiry Congress had authorized." The rehearing of the appeal by the full bench of the appellate court has been granted in response to the Government's petition that the ruling of the 3-judge panel ran counter to previous rulings of the same court on similar issues of law. However, a Washington Post editorial of Jan. 29 quoted a 1936 ruling of Judge Groner of the same court which appeared similar to that of the 3-judge panel.

"GENERAL FITNESS" The exchange between Albert Sprague Coolidge and the Library of Congress has further heightened public awareness of the extent to which unreasonable security considerations have crept into areas where their justification is at best obscure and their presence offensive. Coolidge is a lecturer in chemistry at Harvard and an amateur musician of note. His mother, Elizabeth Sprague Coolidge, financed the Coolidge Foundation of the Library of Congress, which sponsors an ambitious program of chamber music as a public service. On Feb. 1, Coolidge disclosed that Librarian of Congress L. Quincy Mumford, on the basis of security considerations, had withdrawn an invitation to Coolidge to replace his mother, who died in 1954, on the 3-member advisory committee of the Foundation. The invitation had been made in 1954, but because of a nominal salary of \$250 per year the appointment was subject to federal employment procedures, including a security check. This investigation turned up "derogatory information" of which many people could not see the significance to the appointment. Mumford, however, considered them "part of a person's general fitness" and quashed the appointment -- even though he conceded they did not necessarily constitute a basis for a "security risk" finding.

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H - BOMB EFFECTS MINIMIZED

A thorough analysis of several aspects of the radiation hazard of weapons testing was given by AEC Commissioner Willard F. Libby at Northwestern University Jan. 19. He pointed out that the most dangerous product of nuclear explosions is Strontium 90, which goes into the bones because of its chemical similarity to calcium. Libby concludes that it would take about 11,000 megatons of fission yield (Ed. - about 1000 Bikini size bombs) to produce the maximum permissible concentration in humans, and "since radiostrontium is absorbed in the bones, it constitutes essentially no genetic hazard, because its radiations do not reach the reproductive organs."

EDEN ON BOMB TESTS Just prior to his talks with President Eisenhower, Prime Minister Eden discussed the H-bomb testing problem in a BBC broadcast Jan. 21. Britain is making the bomb, Eden said, because it is the most powerful existing deterrent to war, and tests are necessary because a bomb cannot be proved until it is exploded (N. Y. Times, Jan. 22). "This does not mean that I would not like an agreement to restrict and regularize them," said Eden, and conceded that "deterrents are not a real, positive way to peace."

On Feb. 13, in a report to the House of Commons on his visit to the US, Eden said he discussed with Eisenhower "the possible regulation or limitation of nuclear weapon tests." He said the US and British governments "at present share the conviction that the radiation dose to human beings arising from the testing of megaton weapons at the present rate is insignificant compared with the radiation dose received from natural causes."

SECREC Y IMPEDES A-PROGRAM (Continued from Page 1). recognized that the effective prosecution of its recommended objectives would require "less secrecy and a freer flow of significant information." Declassification of all reactor technology was recommended and it was proposed that only information directly related to nuclear weapons development be regarded as "born classified."

Reaction to the Panel report was generally favorable. In a statement Feb. 4, the FAS Council commended particularly the proposals for freer flow of information, atomic cooperation with foreign countries, and controlled thermonuclear power development.

Shortly after the McKinney Report appeared, controversy flared between Sen. Clinton Anderson, chairman of the Joint Atomic Energy Committee, and Lewis Strauss, AEC chairman, on the problem of secrecy of thermonuclear power developments. Strauss' statement that demands for lifting information controls in this area were based on a lack of understanding of the situation was countered by the Senator's demand that the AEC live up to its responsibility of keeping the Committee fully informed.

F A S NEWSLETTER

Federation of American Scientists
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WORLD DEVELOPMENTS ON A-POWER

After a preliminary conference in Brussels on Feb. 11, the foreign ministers of Belgium, France, Holland, Italy, Luxembourg and West Germany have recommended to their governments the creation of a continental atomic energy pool. Plans call for joint use of technical personnel, skills, and materials to mainly speed development with regard to the use of atomic energy for industrial purposes. News of the conference was greeted with assurances of US support. Britain, though willing to be "closely associated" with the plan, is apparently unwilling to become too intimately involved with what may become a supranational authority.

Meanwhile, steps have been taken by many other nations to advance their atomic energy programs. Uruguay has become the 28th nation to sign a treaty with the US providing for 2-way exchange of atomic information. France and Yugoslavia are pushing their programs vigorously and Egypt has announced it will receive help from Russia in setting up a nuclear physics laboratory.

Twelve invited nations, including Russia, will attend a conference opening in Washington Feb. 27 to consider the text of a statute for establishment of the new International Atomic Energy Agency under UN auspices. Once the agency has been established, 84 nations are to receive invitations to join it.

McCARRAN-WALTER ACT REVISION

On Feb. 8, President Eisenhower outlined to Congress the Administration's proposed changes in the Immigration and Nationality Act of 1952 (McCarran-Walter Act). These changes covered four general areas: (1) establishment of more realistic quota ceilings based on the 1950 census and allocation of the increases in accordance with actual immigration to the US since 1924; (2) relieving Congress of thousands of private bids for relief of aliens by granting the Attorney General "limited discretionary powers to grant relief;" (3) removal of unnecessary restrictions and administrative requirements with respect to visiting aliens and travelers through the US; and (4) remedying the abuse of legal process by deportable aliens who have resorted to repeated judicial appeal.

Of particular interest is a proposed special quota of 5,000 to be used without regard to nationality for "those whose services are determined by the Attorney General to be needed urgently in the US because of the high education, technical training, specialized experience, or exceptional ability..." The removal of "travel obstacles" such as the reciprocal waiving of fingerprinting for visiting aliens is encouraging, but many of the stringent requirements for visitors' visas now in force were ignored in the message. Sen. Watkins (R, U.) and Rep. Keating (R, N.Y.) are expected to introduce legislation to implement the proposals.

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