

F. A. S. NEWSLETTER

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

UN ASKS END TO TESTS

An immediate end to nuclear weapons tests, and implementation of a test ban treaty with effective controls, was called for by the United Nations General Assembly in a 71-20 vote on November 6. The resolution was opposed by the United States and Britain, who want the test ban to take effect only after a treaty with controls has been agreed upon. France and seven other non-communist countries joined the United States in opposing the resolution, as did the ten-nation Soviet Bloc, including newly-admitted Outer Mongolia. The Soviet position is that any test ban should be part of a general disarmament treaty. India had introduced the test-ban resolution, which was also sponsored by Ethiopia, Ghana, Nepal, the United Arab Republic, and Yugoslavia. (NYTimes 11/7).

A giant 50-megaton nuclear device exploded by the Soviet Union was the trigger for the activity in the UN. Premier Khrushchev had predicted the explosion in a speech in Moscow on Oct. 17. His announcement led to an appeal by the UN General Assembly, passed 87-11 on Oct. 27, that the test not be carried out. (NYTimes 10/18, 28, 31). Strong protests against the big Russian explosion were made in Japan, Britain, Norway, and Italy, but reaction from unaligned countries was relatively mild. (W. Post 11/1). The Organization of American States acted on Nov. 6 to express its "deep concern over the Soviet tests. Cuba abstained. (NY Times 11/7).

At least five further explosions have followed the big blast of Oct. 30, bringing the Soviet total to at least 31 since their test series began Sept. 1 (NYTimes 11/5). United States Ambassador Arthur H. Dean told the General Assembly that the Russian test series accounts for "substantially more

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F.A.S. COUNCIL MEETING

U. of CHICAGO CAMPUS—NOV. 24-25

Fri., Nov. 24—8:30 P.M.—at Eckhart Hall, Room 133

Sat., Nov. 25—2:30 P.M.—at Classics Hall, Room 10

A CLARIFICATION OF THE FALLOUT PROBLEM

Since the resumption of atmospheric testing by the USSR, the public has been concerned and confused about the effect of the fallout that will be brought down in unknown quantities upon the United States when the rains come in the spring. The questions are asked: What are the dangers of fallout? What is the government doing about it? The answers to these questions appeared in a statement released by the U.S. Dept. of Health, Education and Welfare on October 26. Pertinent excerpts from the statement appear below and the complete text is available from Mr. Judson Hardy, Public Affairs Officer, Division of Radiological Health, Public Health Service, Washington, D.C.

Fallout levels resulting up until now within the U. S. from the new series of Soviet nuclear tests do not warrant undue public concern, nor initiation of public health action designed to limit intake of radioactive materials by individuals or large population groups in any part of the country.

However, present levels do warrant continuous, intensive surveillance by Federal, state and local governments and consideration of protective measures which might be taken if they should be found necessary.

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SCIENCE RESOURCES PLANNING OFFICE ESTABLISHED BY NATIONAL SCIENCE FOUNDATION

Establishment of a Science Resources Planning Office in the National Science Foundation was announced on Oct. 23 by Dr. Alan T. Waterman, NSF Director. The Office will serve as a focus for studies of the nation's future needs and resources for research and education in science.

Dr. Richard H. Bolt has been named to head the SRPO and to occupy a new Foundation position, Associate Director (Planning). Since January, 1960, Dr. Bolt has served as NSF's Associate Director (Research).

"The importance of scientific progress," said Dr. Waterman, "and the rapid growth of our science and technology call for increased abilities to analyze trends, to study the effects of Federal programs on the conduct of research and teaching in science, and to anticipate future demands on the nation's science resources." The new Office, Dr. Waterman stated, will pull together needed analyses of critical issues and will present the results in forms particularly suitable for use in policy formation and decision making.

The SRPO, in studying science resources, will use information developed in co-operation with educational institutions, with industry, and with government agencies. It will also encourage and sponsor relevant studies by other organizations, both public and private. In carrying out its responsibilities, the Office will be responsive to the needs of the Federal Council for Science and Technology and of the office of the President's Special Assistant for Science and Technology.

"The word 'resources' in the name of the Office," said Dr. Bolt, "means the scientists and engineers who teach and do research, their equipment and publications, the facilities and institutions in which they work, and the dollars they spend. It also covers the products of science—new knowledge and new trained personnel—for these are in turn resources for

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IODINE 131 DANGER REPORTED

The St. Louis Citizens' Committee for Nuclear Information has issued a special bulletin (10/26) concerning dangers of Iodine 131 contamination in milk. The CNI reports that I 131 was present in St. Louis milk to the extent of 500 micro-microcuries per liter at the end of Sept., 1961, a concentration about six times greater than that measured in 1958, a period of active U.S. and Soviet testing.

The problem of I 131 contamination has not previously been dealt with because the isotope, with an 8 day half-life, usually decays before the fall-out reaches the human body. However, the CNI says that the present intensive Soviet testing, coupled with an unfortunate combination of atmospheric conditions, might bring the I 131 down before it had decayed to safe levels. The CNI Technical Division estimates that, if this occurs, levels of 5,000-10,000 micromicrocuries per liter of milk are not impossible. Such levels fall within Range III, defined by the Federal Radiation Council (see "A Clarification of the Fallout Problem," this issue).

The CNI points out that, in the past, difficulties in isotope analysis have delayed determinations to the point that it would have been too late to take any action if I 131 had been present at high levels. It therefore urges that those responsible for public health consider such preventive measures as administration of small doses of non-radioactive, non-toxic iodine compounds to pregnant mothers, infants, and small children, which would dilute the I 131 to safe levels. The CNI believes that this supplement should be continued for some weeks after the cessation of large-scale testing.

UN ASKS END TO TESTS

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radioactive fallout than all the tests by the U.S., Britain, and France since 1945." (W. Post 11/7).

Atmospheric Test Preparations Ordered

President Kennedy announced on Nov. 2 that he had ordered preparations for renewed atmospheric tests in case our evaluation of the Soviet test series shows such tests to be "necessary to maintain our responsibilities for free world security." But he added that we "will continue to be ready to sign the nuclear test treaty which provides for adequate inspection and control." (NYTimes 11/3). A draft treaty had been presented to the Russian test-ban negotiators at Geneva in April, but had been quickly rejected. (Newsletter May 1961).

Premier Khrushchev told reporters on Nov. 7 that "there will be more Soviet tests if the West goes on testing." He acknowledged that weapons tests are "harmful to health. But the use of nuclear weapons in war is a million times more dangerous." (W. Post 11/8).

A MESSAGE FROM F.A.S. CHAIRMAN

All members of FAS can be proud of the part which our organization played in working for the passage of the bill to establish the new U. S. Disarmament Agency. We are certainly all very pleased that this bill was passed by Congress before it adjourned. I believe that our National Office was particularly effective in this intensive effort and that the series of briefing breakfasts which were held for Senators, Congressmen, and members of their staffs with expert speakers from the scientific and disarmament fields were especially of considerable importance in the successful passage of this important legislation. I hope that all members of FAS will feel that the expenditures that were made from our budget for this purpose were well-justified.

JOHN S. TOLL

A CLARIFICATION OF THE FALLOUT PROBLEM

(Continued from page 1, col. 1)

Effects of Exposure

Much has been learned about the biological effects of heavy exposure to radiation through studying individuals who have received large amounts of radiation from accidental consumption of radium, for example, or from overexposure to X-rays, and by extensive research on animals.

On the other hand, very little is known about the effects on animals or humans of very low but prolonged exposures, such as from natural background radiation, radioactive industrial wastes, or fallout from distant nuclear tests.

The consensus of scientific opinion is that the most prudent course is to assume there is no level of radiation exposure below which one can be absolutely certain that harmful effects may not occur to at least a few individuals when sufficiently large numbers of people are involved. This is known as the "nonthreshold" concept.

Adopted for Planning

The nonthreshold concept has been adopted as a basic assumption for planning purposes by the United States Government and many national and international scientific organizations. It is the basis for U. S. policies and programs for the assessment of radiation hazards and for control measures designed to limit exposures of large population groups.

When this nonthreshold concept is applied to present radiation exposure levels being experienced in the U. S. from all sources, including fallout, the following assessment can be made:

- The extra radiation caused by the Soviet tests will add to the risk of genetic effects in succeeding generations, and possibly to the risk of health damage to some people in the United States.

- It is not possible to determine how extensive these ill effects will be—nor how many people will be affected. At present radiation levels, and even at somewhat higher levels, the additional risk is slight and very few people will be affected.

Nevertheless, if fallout increased substantially, or remained high for a long time, it would become far more important as a potential health hazard in this country and throughout the world.

Obligations of Governments

It is the obligation of our Federal and state governments to undertake all possible measures to assess accurately the public health significance of the present fallout situation, and to prepare for actions to safeguard the public health if these become necessary.

The steps involved are as follows:

1. Maintain continuous, Nation-wide atmospheric surveillance, for "alerting" purposes, of fallout levels in terms of "gross beta activity," which means measuring the total radioactivity of air samples by counting their beta radiation emissions. These measurements serve as a quick indicator of fallout in any particular area.

2. The Public Health Service has determined that when fallout detected in any particular area reaches an "alert"

level of 100 micromicrocuries (a micromicrocurie is a millionth of a millionth of a curie, which, in turn, is equivalent to the radioactivity of 1 gram of radium) of gross beta activity for five to 10 days, further action is indicated.

This consists of Federal, state, and local governments cooperating to determine the amounts of the different radioactive substances present in the fallout of the area.

This is necessary because of the variation in body distribution, retention time within the body, and "half-life" of the various radioactive components of fallout. "Half-life" is the time required for a radioactive substance to lose one half of its radiation strength. From a health standpoint, among the most important fallout constituents are these so-called "beta emitters":

- Iodine-131: Half-life, 8 days; disposition—thyroid gland.
- Strontium-89: Half-life, 53 days; disposition—bone.
- Strontium-90: Half-life, 27 years; disposition—bone.
- Cesium-137: Half-life, 27 years; disposition—whole body.

3. After these determinations have been made in any particular area, the next necessary step is to interpret the levels found in air, water, or particular items of food, in the light of the guidelines for human exposure recommended by the Federal Radiation Council for normal peacetime operations and accepted by the President on Sept. 20, 1961.

These guidelines reflect a scientific consensus on the potential hazards of radiation balanced against the reasons for accepting the hazards, and are expressed in terms of three different "ranges."

The upper limits of Range II intake were considered by FRC as an acceptable risk for a lifetime, but it was recommended that average daily intake for only 1 year be used for administrative and regulatory purposes.

The ranges and graded actions recommended in the FRC report are as follows:

Ranges of daily intake (micromicrocuries per day averaged for 1 year) for use in graded scales of action:

Radionuclide	Range	Range	Range
	I	II	III
Iodine-131	0- 10	10- 100	100- 1000
Strontium-90	0- 20	20- 200	200- 2000
Strontium-89	0-200	200-2000	2000-20,000

Graded Scales of Action:

- Range I Routine surveillance.
- Range II Detailed surveillance and analysis.
- Range III Consideration of control measures designed to limit intake.

4. At average levels tending to exceed the upper limit of Range II, FRC guidance indicates consideration should be given to possible actions that could be taken to reduce exposures of the population.

The radionuclide of principal concern at the moment is iodine-131, which, as already announced, is appearing in fresh food, particularly milk. It should be emphasized that the quantities of iodine-131 that have accumulated in milk to date (Oct. 26, 1961) do not exceed the Federal Radiation Council guidelines for yearly consumption under normal peacetime conditions.

THE EXPANDING WORLD POPULATION —A CHALLENGE TO F.A.S.

Report of the F.A.S. Committee on Population Growth

It is interesting to realize that the survival of an advanced civilization on this planet depends upon the ability of all mankind to reverse its attitudes in regard to two fundamental practices that have been necessary for man's survival over the past hundred thousand years or so. These are man's attitudes toward war and procreation.

Man lifted himself above the animal kingdom by his superior intelligence and greater ability to kill and to wage war. Today with modern technology in the form of atom bombs, hydrogen bombs, chemical warfare, biological warfare, rapid communications, and intercontinental ballistic missiles, the continuation of civilization depends not on man's ability to wage war, but upon his ability to refrain from waging war.

In addition to man's conquest of the animal kingdom, man's survival upon the earth has in the past depended upon his ability to procreate. For the past tens of thousands of years man's survival has been a close contest between high birth rates and high death rates. Modern technology and modern medicine have changed the balance in this contest. As a result, high birth rates still persist, but high death rates are almost universally gone. The unbalance is causing an explosive population growth. For example, the population of Great Britain grew slowly from the year 1000 to 1348 when the Black Death cut the population in half in less than two years. It took 150 years for the population to grow back to its former value of about four million. The curve rose slowly until about 1775 when it made a sudden upturn. From then on, the population of Great Britain has been growing faster and faster. What happened in 1775? From 1725 to 1785 five hospitals were built in London. By 1825 over one hundred fifty hospitals were established in Great Britain. Smallpox inoculation was introduced. Fewer people were dying. At present the world population is growing at the rate of 1.75 per cent per year, which causes a doubling in forty years, and the doubling time is still decreasing.

M. C. Chagla, Ambassador from India, recently said, "Civilization has shown us how to reduce our death rate but so far has failed to point the way to a controlled population. I think this is one of the most important issues of conscience in modern medicine. Medicine must advance on both the fronts. If it considers life is sacred and everything must be done to prolong it, it must also prevent human beings from being born into an existence of poverty, destitution, and frustration. The sanctity of life demands that the dignity of the individual must be upheld. What dignity will millions of children have who are being born today? When you have unwanted children, when you have children whom you cannot feed or clothe or educate, you maim the soul—you leave a scar which destroys the equanimity of mind and twists and distorts the human personality."

ROLE OF THE F.A.S.

The F.A.S. in relation to its size and monetary expenditures has played a disproportionately large part in alerting the public and influential people in Washington to the hazards of atomic warfare. More recently F.A.S. has begun to turn its attention to the other equally important threat to mankind.

At the January 1960 meeting the F.A.S. Council formed a permanent Committee on Population Growth with the following objectives:

1. To improve public understanding of the implications of continued population growth.
2. To encourage all F.A.S. chapters and members to publicize the need for study and research: in the relationship between population size and available resources, in more efficient utilization of resources, in conservation of resources, and in human reproduction and population control.
3. To help initiate research teams in hospitals or medical schools.
4. To urge government support of research of all phases of human reproduction.

The recent controversy about United States aid to foreign countries seeking help with population control is meaningless at the present time because there is no satisfactory birth control method for the underdeveloped nations. Methods of birth control that are not adequate but usable for our ad-

vanced technological western society are too costly and too complicated for the poorer and less technically minded masses of the world.

RESEARCH IN REPRODUCTIVE BIOLOGY

An International Conference on Reproductive Physiology was held at West Point in the summer of 1959. The findings of the Conference were summarized by its chairman, Sir Solly Zuckerman, "By setting our knowledge into perspective the conference revealed very clearly that vast areas of the subject are still cloaked in an ignorance which prevents a rational and scientific approach to the problem of population control. The first lesson is therefore that it is necessary to stimulate further basic research. . . ."

One biologist has pointed out that in the complicated process of human reproduction there are twenty-three different places where the process could be interrupted and a birth prevented. Today we have insufficient knowledge to understand in detail the biological intricacies of even one of these twenty-three processes. To satisfy the needs of all the people of the world with their great social and economic variety, we must have sufficient background information to work out several simple methods of birth control.

To do this fundamental research in the biology of human reproduction will require a large effort. To get the job done in time to save millions of people from a fate of slow starvation will require a greatly accelerated effort. By "effort" we are not discussing just the expenditure of money. Brilliant young men coming out of medical school or receiving Ph.D.'s in biology or biochemistry or even physics must be motivated to do this research. This research work must be recognized as important. The public must be clamoring for the solutions to the biology of human reproduction in the same way as it is clamoring for the solution to cancer. Our job is to awaken the public to the need for the solution of the birth control problem. Then both the monetary funds and the intangible incentives will be available.

PRACTICAL CONSIDERATIONS

Thirty years ago, industry did not consider that it was its duty to support universities. Today it does. In the same way, we must change the public outlook so that the board of directors of a large company will not need to justify to its stockholders the expenditures for research and development of birth control methods. It should be recognized that overpopulation will be the most important factor affecting the business climate of the world forty, twenty, even ten years from now.

How can this necessary fundamental research in the biology of human reproduction be accomplished? Experience in the physical and biological sciences indicates that teams of workers of several disciplines are necessary to attack such complex problems. The F.A.S. brings together scientists from many fields, and because of their technical training they are well equipped to comprehend and initiate the fundamental biological research needed. We believe F.A.S. members should help in setting up many research teams in medical and biological schools. A team might consist of five men: a biochemist, a physiologist, an endocrinologist, a gynecologist, and an embryologist.

F.A.S. members working individually or in F.A.S. chapter committees can perform a vital service to mankind by emphasizing the importance of this problem to the people capable of doing this research. F.A.S. members can act as catalysts to get the people with the skills and know-how to react with each other to organize both individual and cooperative research programs in the biology of human reproduction.

In some cases F.A.S. members may find it necessary to help find financial support to initiate this team research. Because it is the policy of many government agencies and large private foundations to support only established research, it is necessary to find funds to initiate research. Once the research is established, usually many sources of support become available.

At the present time the F.A.S. Population Committee consists of its co-chairmen, W. D. Bellamy and V. C. Wilson, both members of the Mohawk Association of Scientists and Engineers, an F.A.S. chapter in Schenectady. The committee would welcome a representative from each of the other F.A.S. chapters and several F.A.S. members at large. If anyone is interested in helping, please contact the committee chairmen at the General Electric Research Laboratory, Schenectady, New York.

LETTER TO THE EDITOR

Sir:

In the last two months the Soviet Union has exploded about 100 megatons, presumably as air bursts with about 50 megatons of fission yield. The following is an estimate of the effect of this Soviet testing on the strontium-90 levels in the average American diet.

To first approximation this estimate can be made by looking at a comparable situation, the strontium-90 levels in American food in the Spring of 1959 which followed intensive testing of the preceding year. In 1957-58 the Soviet Union released 21 megatons of fission,¹ compared to 19 megatons of fission for the United States and United Kingdom. Only 20% of the US produced fission products go into global fallout because they are surface tests; while nearly all of the Soviet air bursts go into global fallout.² The latitude effect further reduces the US-UK fallout on the continental United States as compared to the Soviet tests.³ It seems reasonable to assume that the US-UK 19 megatons of fission is equivalent to 4 megatons of Soviet produced fission. Then the grand total for 1957-58 is about 25 megatons fission yield of the Soviet type of tests. If the strontium-90 in American food in the Spring of 1959 was due to this alone, we could say that 25 megatons of Soviet fission yield produces about 15 strontium units in the average American diet.³ This would be the case if the strontium-90 content in food decreases about 30% per year as it seemed to be doing until the Soviet Union resumed testing. However, if the decrease is not real, then the 15 strontium units would have been due to a total equivalent of about 35 megatons fission yield of Soviet type tests rather than 25 megatons.

If 25 megatons of Soviet fission yield produced 15 strontium units in the average American diet, the recent Soviet tests of 50 megaton fission yield will produce twice as much, or about 30 strontium units. This is to be added to the present level of about 7 strontium units. Hence it seems quite reasonable that the average American diet next Spring will exceed the 33 strontium units which is the maximum permissible concentration recommended by the International Commission on Radiation Protection.⁴

Sincerely,
Jay Orear

¹ John M. Fowler, *FALLOUT*, Basic Books, New York, 1960, page 25.

² *NUCLEAR INFORMATION*, Committee for Nuclear Information, St. Louis, Mo., January 1961 issue, page 2.

³ *CONSUMER REPORTS*, page 549, Oct. 1961. (assuming ratio of milk to total diet levels is constant).

⁴ *NUCLEAR INFORMATION*, April 1959 and April-May 1960 issues.

(EDITOR'S NOTE: An article by Prof. John Fowler (Washington University) in the October issue of *Nuclear Information* (St. Louis CNI) reports that fallout from Soviet tests completed up to Oct. 4 will probably raise the strontium 90 level in St. Louis milk to a new peak of 35-40 Strontium Units in the Spring of 1962.)

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HAPPY, THOUGH RADIOACTIVE

The Washington psychiatrist and author, Dr. Frank Caprio, has turned his talents to the problem of fallout shelters (*WPost* 10/20). In collaboration with an interior designer, he has created a series of shelters intended to represent a "symbol of something less frightening" than the usual concrete models. The shelters, to be sold by Shelters for Living, Inc., of New York, will be places of "repose and buoyant relaxation", according to a representative of the firm. Dr. Caprio asserts that the ideal shelter must have enough rooms to give husbands and wives privacy, provide recreation space for the children and permit relaxation in a congenial environment. Accordingly, the builders plan to offer shelters which include a hobby-rumpus room, a music-library room, a study-family room, and a recreation room. Thus equipped, Dr. Caprio believes, it should be possible for the occupants to carry on the normal pattern of family life.

SCIENCE RESOURCES PLANNING OFFICE

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more science, for technology, and for all science-based endeavor."

The long-range planning activities of the several divisions and offices of NSF will be coordinated by the Associate Director (Planning). The Foundation's Office of Special Studies will continue to conduct statistical surveys and special analytical studies of research and development and other activities and their relation to the economy.

It is possible that the creation of the Science Planning Office may be related to earlier interest in coordination of government scientific activities, and particularly to proposals for establishment of a "Department of Science" at the cabinet level.

Dr. Bolt is on leave from the Massachusetts Institute of Technology.

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Chairman..... John S. Toll

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