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FORMER FAS CHAIRMAN OREAR ON "SCIENTISTS AND ETHICS—A CASE HISTORY"

Following is the text of a short paper by 1967-68 FAS Chairman Jay Orear, which he submitted to the Symposium on "Science and Ethics" in Vienna on September 3rd. It is printed here because of its implications for the FAS and FAS members. Some months ago your Editor invited several former FAS Chairmen to try to write briefly for the NEWSLETTER their views on future directions and activities for the FAS, and Orear is the first to respond. The same invitation is hereby extended to ALL former chairmen.—H.L.P.

For the past two years I have been vice chairman, and then chairman of the Federation of American Scientists (FAS). This is an organization of over 2000 scientists concerned with the impact of science on national and international affairs. It was formed in 1964 by many of the scientists who developed the atomic bomb and who, using the words of Sir Karl Popper, felt "a special responsibility in the field in which (they have) special knowledge." Some of the early members had special competence in nuclear physics and atomic weapons. They rather accurately foresaw the present-day consequences of the nuclear arms race. The FAS took many positions on many controversial issues— but always telling itself it would only deal with those questions in which it had a special competence.

The FAS, like most scientists, tries to avoid what is called the "halo effect"; viz., a person who takes advantage of his position of high respect and influence in science by posing as an expert on questions outside his field of special competence. The typical scientist will claim no special privilege in dealing with moral questions. My own personal feeling is that scientists overreact in trying to avoid the "halo effect" and thereby neglect related moral questions which really should be considered by scientists.

An example of this is the soul-searching the FAS went through in developing a policy position on the Vietnam War. In 1966 the FAS officers prepared the following statements and polled the membership for its approval: "After many months of hesitation, the FAS has come to the conclusion that it must speak out on the war in Vietnam, beyond its obvious implications for the spread and the proliferation of weapons of mass destruction. . . . We have considered it inappropriate to take public positions on questions where specialized competence or concern of scientists as scientists was irrelevant. . . . It has become unrealistic if not impossible to consider public policy in almost all areas of FAS concern without facing the war. This is why we must take a formal position, reluctant as we may be to break with a tradition established in two decades of organizational activity." By mail ballot the membership approved taking such a public stand against the Vietnam war by 3 to 1. Not to make such a public position might have left the impression that as far as the FAS was concerned, United States participation in the Vietnam war was all right as long as it stopped the bombing and use of chemical weapons.

Let me give one more example of a recent moral position taken by the FAS. After World War II large American universities began developing various ties with the military establishment which often involved classified work. The FAS could, and did, oppose any kind of secrecy in the university

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NEWS ITEMS

More and more means by which men can control genetic destiny are beginning to appear on the not so distant horizon. This was one of the principal—if inexplicit—themes running through the twelfth International Congress of Genetics which ended a ten-day meeting in Tokyo at the end of August.

In the five years since the geneticists last met, there have been relatively few dramatic scientific breakthroughs—such as the cracking of the genetic code—but new knowledge has been developing on so many fronts and at such a rapid pace that "genetic engineering" possibilities only recently spoken of as many decades or centuries in the distance now seem to be within the lifetime of many of us. The first efforts at genetic control are not likely to be dramatic. They may, for instance, be used to treat obviously undesirable genetic traits, such as hereditary diseases like hemophilia, or simply the breeding of superior plants and animals. But not far in the background are the distinct possibilities of redirecting the entire course of human and animal evolution, of programming cells with new or "artificial" genes, of controlling human behavior, of pre-selecting sex and even of humans duplicating themselves by a sexual reproduction like plants.

All these possibilities raise a variety of complex ethical problems and possible dangers that many biologists fear will not be resolved before the mechanical techniques of control themselves are perfected. Geneticists are increasingly shifting their works to human genetics after focusing for decades on the basic molecular aspects of heredity in lower organisms.

One estimate is that it will be possible within twenty-five years to program human cells with artificial information. Among the scientists who have been most prominent in articulating their concern with the social impact of genetic engineering is H. Bentley Glass of the State University of New York at Stony Brook. Glass urges his colleagues to act before the techniques of genetic engineering outstrip the establishment of ethical guidelines. "The whole environment," commented Glass at one session of the Tokyo meeting, "is under the influence of human activity and alteration. The evolution of every species is certainly being modified very greatly by the presence of man in large numbers everywhere. We quickly learned how to extinguish other species and before long we probably will be creating other species. We are in the position of being the creators of the future living world. I do not believe we can continue to stand in that position blindly." Glass's comments provoked debate; not all agreed that values and ethics were a responsibility of

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FAS GENERAL COUNSEL SINGER ARRANGING SESSION ON "GENETIC TECHNOLOGY: SOME PUBLIC CONSIDERATIONS" FOR DALLAS AAAS MEETING

(Because of its broad significance and probable interest to FAS members attending the Dallas meeting, the range of questions to be addressed and the panel members of the discussion—which is due to Dan Singer's initiative—are listed on an inside page of this NEWSLETTER.)

A CASE HISTORY from page 1

on the grounds that it was incompatible with the basic purpose of free and open inquiry. But on what grounds could the FAS oppose any kind of weapons research in the American university whether secret or not? The FAS did take such a stand in a statement released Feb. 22, 1968 which said in part: "the university should not be a part of the military establishment and should not directly or indirectly take part in military operations or participate in the collection of military intelligence. The university should not enter into any contract-supporting research the specific purpose of which is the development of weapons or devices designed to destroy human life or to incapacitate human beings, nor should it provide administrative services for government weapons laboratories. For example, it is inappropriate for the University of California to lend its name and implicit endorsement to the weapons laboratories at Livermore and Los Alamos."

One could argue that the main justification of the above policy position is not scientific competence, but moral competence which is shared in principle by all men, not just scientists. On the other hand one could also argue that the FAS which contains a nationwide pool of university staff members is merely trying to protect the traditional university role of safeguarding human values and human rights, and of working toward the improvement of man and society—rather than their destruction. Certainly the nature of university scientific research is of concern to scientists and I believe they do have a special right to comment on the moral aspects of such research.

I guess I am advocating that scientists worry less about the "halo effect" and involve themselves with more of the important moral questions of the day, even if the relation between those questions and science seems indirect. As long as a relationship does exist, scientists should have a special concern and do have some special "competence" to contribute. In this atomic-space-computer age, science is spreading quickly to almost every corner of our society. We have reached the point where many key moral and political decisions must be based, in part, on technical knowledge and scientific judgment. These are decisions which should not be left to the politicians alone, since most politicians (and even social scientists) are seriously lacking in scientific background. Scientists have an obligation to keep up with the times and to recognize the role they can and should play in modern society. Not only should scientists be expected to participate in making the great decisions, but they are good at perceiving future problems (and solutions to them) as well as being useful critics of the past and present.

NEWS ITEMS — Continued

scientists. Herman M. Slatits of Michigan State University remarks, "one of the difficulties is that as scientists we are not trained to discuss values better than anyone else. I would prefer first to worry about facts and how they fit together and then think about values." (*New York Times*; 22 August and 8 September 1968)

The new director of the National Institutes of Health will be Dr. Robert O. Marston. Marston will succeed Dr. James A. Shannon who will retire on September 1st after thirteen years as NIH director—thirteen years which have seen a vast expansion of NIH under Shannon's leadership, widely regarded as outstanding. The appointment of Dr. Marston as NIH Director ends many months of speculation over who would succeed Dr. Shannon.

At a news conference in Washington, Marston counted knowledge above both money and manpower as a crucial element in future improvement in American health. Marston has been administrator of health services and mental health administration within the Department of HEW.

Through the grants that it makes to scientists and institutions throughout the country, as well to research carried out on its own "campus" in Bethesda, Maryland, NIH has greatly influenced the progress of health sciences, particularly during the last decade. It is the federal government's arm

for conducting and supporting medical and biological research, and there is scarcely a field in medical and biological research that has not been nurtured in an important way by NIH. It has also helped to train the scientists who are at the forefront of the current revolution in knowledge of life processes. (*New York Times*; 19 July 1968)

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The satellite the Soviets will supply to the proposed Intersputnik Communications System will have the same synchronous orbit used by the four Satellites that the United States has provided for Intelsat, the international telecommunications satellite consortium. The disclosure came by the Russians at a Vienna meeting of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space. The Soviets evidently plan to use two types of satellites, their existing Molmiya satellite with an elongated spiral orbit, and one with a synchronous type that orbits at the same speed as the earth. Moscow has not yet orbited a synchronous satellite and so far use the Molmiya only for relaying communications within the Soviet Union.

The Soviet spokesman emphasized that every member of Intersputnik would have one vote. This would be in contrast with the weighted voting that gives the U.S. 51% of the votes in Intelsat. A two-thirds majority will be required for important decisions by Intersputnik and respective members will be informed how much they will be assessed at a conference to approve the articles of agreement. The Soviets said that all states would be eligible to join Intersputnik but declined to comment on whether they expected Red China to join. The Soviets will allow any country to hold membership in both Intersputnik and Intelsat. Intelsat already has 62 members. (*New York Times*; 20 August 1968)

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The British government fixed 1975 as a target date for converting all weights and measures to the metric system. The announcement was made in the House of Commons by Anthony Wedgwood Benn, Minister of Technology.

Pounds, shillings, and pence are already scheduled to give way to decimal currency completely by February 1971. The principle of metric measures had also been generally accepted, but Benn's announcement moved the idea from theory to definite policy with the target date.

It is expected that the shift in measurements will help the sale of British exports abroad and bring various economic benefits. A governmental advisory committee estimated that by 1975 the entire world would be on the metric system, except for the United States and Canada; and it noted that even in these countries there is new interest in switching.

Road signs may turn out to be one of the major problems. A speed limit of 50 miles per hour, for example, would be 80 kilometers per hour instead. Road authorities may use the occasion for a general revision of speed limits.

In a related development, the U.S. House of Representatives voted last month for a three-year study on whether the United States should convert to the metric system. The

(Continued on next page)

EDITOR'S NOTE—

Time pressures have again kept your Editor from getting this NEWSLETTER out on schedule, but she hopes to restore the situation effectively in the next two issues and also bring up to date developments connected with the non-proliferation treaty, the Sakharov essay (on which a contribution from some FAS members is in hand) and other issues.—H.L.P.

PLANS FOR PANEL ON GENETIC TECHNOLOGY AT AAAS MEETING

(See Box, page 1)

GENETIC TECHNOLOGY: SOME PUBLIC CONSIDERATIONS

Arranged by DANIEL M. SINGER

(General Counsel, Federation of American Scientists,
Washington, D.C.)

THURSDAY, DECEMBER 26

North Ballroom, Sheraton-Dallas

2:00 p.m. Possibilities, Purposes, and Problems of Genetic Manipulation

Moderator: ROBERT L. SINSHEIMER (*Professor of Biophysics, California Institute of Technology*)

Panelists:

J. E. SEEGMILLER (*National Institutes of Health*)

ANTONY BLACKLER (*Professor of Zoology, Cornell University*)

Discussants:

MARSHALL W. NIRENBERG (*National Institutes of Health*)

DAVID SCHWARZ (*President, Schwarz Bio-Research*)

DAVID DAUBE (*Professor of Legal Ethics, All Souls College, Oxford*)

FRIDAY, DECEMBER 27

Ballroom Foyer, Sheraton-Dallas

9:00 a.m. Public Policy for Genetic Manipulation

Moderator: J. E. Rall (*Director of Intramural Research, National Institute of Arthritis and Metabolic Diseases, NIH*)

Panelists:

HAROLD P. GREEN (*Professor of Law, The National Law Center, The George Washington University*)

EUGENE B. SKOLNIKOFF (*Professor of Political Science, M.I.T.*)

Discussants:

HON. DAVID L. BAZELON (*Chief Judge, U.S. Court of Appeals for the District of Columbia Circuit*)

ROLLIN D. HOTCHKISS (*Professor, The Rockefeller University*)

GORDON M. TOMKINS (*National Institutes of Health*)

The second session will be introduced with a brief review of the existing methods by which public policy is made in health and science. The panelists and discussants will consider whether the existing governmental and scientific institutions are adequate to cope with the problems highlighted in the first session and, if not, what new institutions should be considered. Does the distinction between therapeutic and eugenic uses of genetic technology suggest that different types of controls should be considered? At what point along the continuum from the basic research laboratory to the physician's prescription blank should institutional regulation be imposed? What are the obligations of the investigator or society to the "mishaps" of experiments or applications involving genetic manipulation?

Although much of the discussion may be relevant to the developing techniques of organ transplants, that subject will not be treated as such.

In both sessions, the moderator and each panelist will speak for approximately 30 minutes. The balance of each three-hour session will be devoted to discussion. The moderator of each session will determine the extent to which the audience may participate directly in the discussion.

Current research in genetics is developing ideas and techniques that may make possible the manipulation of human heredity. The first session will be introduced with a brief overview of recent scientific advances, and of possible technological applications. The panelists will summarize the relevant scientific findings in their particular fields (e.g., synthesis of genes, cloning of identical individuals by nuclear transplantation, selection *in utero*); discuss the likely technological developments and difficulties and their therapeutic and eugenic significance; discuss the biological consequences of genetic manipulation on the fitness of the human genotype; consider the ecological consequences of alteration in the human genotype of gene pool.

The panelists and the discussants will together consider what kinds of genetic manipulation, if any, are necessary and/or desirable and why, and what therapeutic and eugenic goals should be sought. Some consideration of the ethical and social problems will necessarily be relevant.

(Note: Audio tapes and possibly some educational TV coverage of this session are contemplated. Inquiries may be made to the FAS office.)

NEWS ITEMS — Continued

Secretary of Commerce is to make the study. (*New York Times*; 27 July 1968)

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A three-year study will try to decide whether the United States should adopt the metric system of measurement. On August 14, President Johnson signed a bill ordering the study on a possible switchover to the metric system which is used through most of the world.

The law is the first one on the metric system to be enacted since 1866, when Congress made the meter, liter, and kilogram optional for use in this country. Congress directed that the new study be made by the Department of Commerce, which is expected to delegate the project to the National Bureau of Standards. Alvin G. McNish of NBS, who is expected to conduct the study, said in Washington that the project would proceed slowly for the first year because Congress provided no special funds for it. McNish, regarded as the leading authority at NBS on metric system, said a changeover to the system would cost industry and consumers little if it were well planned. In any case, he said, there would be no sudden conversion—partly because the use of metric measurement already is growing rapidly. He noted that the use of the metric system was "very extensive" in the United States, and that many products were being manu-

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Chairman _____ Cameron B. Satterthwaite

The FAS Newsletter is prepared in Washington.

Editor: Harriette L. Phelps.

Approx. closing date for this issue: 10 Sept. 1968.

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

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

NEWS ITEMS — Continued

factured with both English and metric dimensions. He said the extent of metric use would be one of the first things to be determined by the study.

An estimated 90% of the world now uses the metric system. (The British have already begun a switchover to metric currency and have plans for switching their basic measurement systems also. It seems likely that the relative British initiative may eventually make it easier for the U.S. to follow suit.—HLP) (*New York Times*; 15 August 1968)

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Otto Hahn, who discovered how to split the atom in 1938, died in Göttingen, Germany on July 28 at the age of 89.

"This conclusion violated all previous experience in the field of nuclear physics!" With these excited words, Hahn described his initial, unbelieving reaction to his discovery in December of 1938 that the atom could be split—a discovery that almost overnight changed the course of 20th century history. The German chemist's astonishment was matched by that of the world's scientific community when it learned of the discovery some weeks later.

What he had helped to unleash came as a shock to Hahn in later years. "I never thought anything war-like would come of my discovery of uranium fission," he said. "I am a scientist and like all scientists am interested in only discovery and not application."

Hahn's apparent discovery of nuclear fission was reported in *Die Naturwissenschaften* in December 1938. It remained for physicists Lise Meitner and Otto Frisch to direct attention to the enormous energy release associated with the fission process in their now famous letter to *Nature* which was published on February 11, 1939.

Hahn was born in Frankfurt in 1879. He studied at the University of Marburg and Munich, and began his work on radioactivity under Sir William Ramsey at University College in London. After a year at McGill University in Montreal with Rutherford, Hahn returned to Germany in 1906. From then on the bulk of his professional career was spent at the Kaiser Wilhelm Institute in Berlin. He achieved the Nobel Prize in Chemistry in 1944. In 1966 he retired, and the same year shared the \$50,000 Enrico Fermi Award from the U.S. AEC with Lise Meitner. (*New York Times*; 29 July 1968)

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Demonstrations in Hiroshima on August 6 marked the 23rd anniversary of the world's first atomic attack. Some 40,000 persons gathered in Peace Park in Hiroshima today and prayed for the 200,000 victims of the attack 23 years ago. Hiroshima's mayor placed at the memorial cenotaph in the park a list of 1100 persons who died in the last year from the effects of the atomic blast. This addition of the list of persons who died during the last year brought to an official 63,524 the number of those whose death has been attributed to the bomb. Japanese officials believe that this represents only about one fourth of the people who actually died as a result of the blast.

In Washington, also on August 6, anti-war demonstrators presented a note of apology to the Japanese Embassy and demonstrated in front of the White House. These actions were taken jointly by the Quaker Action Group, the Catholic Peace Fellowship, and the War Resister's League. (*New York Times*; 7 August 1968)

AAAS has urged the United Nations to sponsor a long-term, on-the-spot study of the effects of herbicides being used by U.S. forces in Vietnam. The chemicals are apparently being used in increasing amounts to destroy vegetation that can conceal enemy infiltration routes both in forests and along waterways. Between 1965 and 1968, according to the Defense Department, the amount spent on these chemicals rose from \$10 to \$70 million annually.

Many scientists have previously expressed concern about the long-range effects of the herbicides used in Vietnam. In its unusual appeal to the U.N., the AAAS (the nation's largest scientific organization) said that on the basis of

available information it could not share the confidence of the Defense Department "that seriously adverse consequences will not occur as a result of the herbicidal chemicals in Vietnam."

Because of widespread concern with the possible effect of herbicides, the Defense Department authorized a study of the effects by the Midwest Research Institute of Kansas City, Missouri. The Institute's report released last February, concluded that there were no clear indications of long-term damage as a result of the widespread aerial spraying to strip Vietnamese war zones of foliage. But the report said that there was not enough information to assess the effects with confidence. In its review of the Midwest Research Institute report, the National Academy of Sciences (NAS) noted a dearth of information on the ecological effects "of repeated or heavy herbicide applications." Although most of the herbicides in use in Vietnam have been used extensively in the United States to clear agricultural fields, roadways, and railroad right-of-ways, there is concern that the ecology of Vietnam is far different and the concentration of herbicide use there much higher. The AAAS appeal to the U.N. called for a Vietnamese field study that would include "participation of Vietnamese scientists and scientists from other countries, with cooperation, support, and protection provided by the contending forces in the area." (*New York Times*; 20 July 1968)

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Britain has asked the Geneva disarmament conference for the early conclusion of an international agreement outlawing germ warfare and banning the production of the means of waging it. On August 6, Fred W. Mulley, British Minister of State, proposed a convention that would have nations do the following things: declare germ warfare to be "a crime against humanity"; undertake never to engage in such warfare "in any circumstance"; forbid the production of "microbiological agents" for other than peaceful purposes.

The British plan represents the first detailed project for a new international arms agreement to be submitted to the Conference since it began its current session in July. An initial Soviet response indicated that Moscow did not favor a new international pact on biological or chemical weapons but would like to see more nations subscribe to the 1925 Geneva protocol that prohibits the use of such weapons. The United States has never ratified the 1925 protocol, although both Presidents Roosevelt and Truman put on the record the intention of the U.S. to abide by the spirit of its provisions.

The British intent is evidently to "supplement and not to supersede" the existing protocol with an agreement covering only microbiological warfare. It was noted that shortcomings in the 1925 Pact include doubts about the nature of legal obligations assumed under it and its failure to ban the manufacture of the outlawed weapons. Mr. Mulley deplored the restricted nature of the 1925 agreement because some of the 54 states subscribed to it, including the Soviet Union and Britain, reserved the right to use the banned arms against countries not bound by it. (*New York Times*; 7 August 1968)

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There is speculation that the Soviets may be developing a rocket with about twice the thrust of the Saturn 5, the U.S.'s biggest rocket. The speculation reflects continuing concern on the part of NASA officials that a so-far concealed Russian rocket thrust in the vicinity of 15 million pounds would enable the Russians to surprise the world by landing men on the moon before the American target date for the same achievement which is the end of 1969. The three-stage, liquid-fueled Saturn 5 was conceived as the minimum size rocket to get men to the moon by the plan adopted early in the decade by the U.S. If the Soviets should have a rocket with a much higher thrust than the Saturn 5, they would have more technical flexibility in their efforts to reach the moon. (*New York Times*; 14 August 1968)

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NEWS ITEMS — Continued

The National Academy of Sciences advocates an ambitious program of unmanned interplanetary flights. The NAS, in a report released on August 14, urged the National Aeronautics & Space Administration (NASA) to plan for flights even to Jupiter, some 500 million miles away. The NAS proposals envision space craft that would brush past Mercury and Jupiter to collect scientific data, plus orbiter and landing vehicles that would examine Mars and Venus closely much as the Moon has been studied to date. While the NAS report of planetary exploration did not fix the cost of the program, which would last seven years, a check of previous estimates for such vehicles suggests that the bill would be at least one billion. The NAS report urges restoring cuts in the national budget for unmanned planetary exploration. At present all but a very small fraction of NASA's budget is going into manned space flight. NASA's present plans now call for the launching of two orbiter crafts to Mars in 1971 and two landing vehicles there in 1973.

The NAS foresees a greatly expanded program of about ten more missions to the planets, not only to Mars but also to Venus, Jupiter and Mercury. The NAS also urged that radar astronomy be expanded by the construction of a major new observatory 100 to 1000 times more sensitive than existing systems, that infrared and optical telescopes be built, and that liaison be established with Soviet scientists as the prelude to joint planning of planetary exploration. The NAS report said that the aim of the program would be threefold: to seek better understanding of the origin and evolution of the solar system, the origin and evolution of life, and the dynamic processes that shape man's terrestrial environment.

The Soviets have already penetrated the Venusian atmosphere with instruments. According to NASA sources, the Russians plan to not only continue their interplanetary study program but also to accelerate it. The NAS report suggested that joint planning of interplanetary exploration with the Soviet Union would permit each nation to undertake specific tasks that did not overlap. The report did not advocate that the two nations cooperate in launching flights together.

The NAS report disagreed with proposals that the next major space goal after landing on the moon be the landing of men on Mars. It observed that many of the more puzzling scientific questions about nearby planets could be answered with unmanned spacecraft. "While at some time in the future it may be in the national interest to undertake a manned program to the planets," the report said, "we do not believe man is essential for scientific planetary investigation at this stage." (*New York Times*; 15 August 1968)

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Water pollution in the New York city area has been described as a disaster that is affecting the region's ecology. Conservationists and public officials at the Rockefeller University meeting, sponsored by federal, state and city agencies, said the fish and shellfish industries had been shattered and the spawning areas of estuarial rivers and streams had been poisoned. It was also reported that the billions of gallons of sewage, pesticides, detergents, chemicals, garbage and other refuse that are poured daily to the waters has added so many new nutrients that algae has begun to proliferate at an alarming rate. One speaker drew a parallel with the virtual strangulation of the animal life in Lake Erie by algae, which used up all the available oxygen. The Rockefeller University meeting was the second of five that will be held in the Northeast to discuss the impact of pollution on coastal and estuarine waters. These meetings will be a part of a total of 23 similar meetings in all parts of the country to assist the federal Water Pollution Administration in preparing a comprehensive report to Congress due on 1 November 1969.

Merrill Eisenbud, New York's Environmental Protection Administrator, said the city would spend about \$2 billion during the next decade to abate air pollution, improve refuse disposal, assure adequate supply of potable water, and restore the estuarine environment. (*New York Times*; 24 July 1968)

The U.S. successfully tested two new missiles capable of carrying MIRV's (Multiple Independently Targetable Re-entry Vehicle). The test, carried out at Cape Kennedy on August 16th, involved both the Navy's Poseidon missile and the Air Force's Minuteman 3 missile. The new missile systems are believed to be technically more advanced than anything the Soviets have so far flown. The tests came at a time when the U.S. and Soviets were taking tentative steps toward the conference table to discuss the possibility of a treaty to curb the nuclear missiles (see discussion elsewhere in this NEWSLETTER and in next month's NEWSLETTER).

The Navy and Air Force announced that the tests were "complete successes" but gave no details. The two-stage, solid fuel Poseidon flew some 1000 miles down range in the Atlantic. The Minuteman III, a three-stage solid fuel missile, flew about 5000 miles to a target zone near Ascension Island in the South Atlantic.

The Navy Poseidon is designed to replace the submarine-launched Polaris missile, of which some 656 are now deployed on the nation's 41 nuclear-powered missile launching submarines. The Minuteman III is a more powerful version of the thousand odd Minuteman I and II missiles deployed in underground silos throughout the western United States. The Soviets are said to have more than 720 land based intercontinental missiles.

The Poseidon weighs 65,000 pounds, more than twice the weight of a Polaris. This makes it possible to carry up to ten warheads in a MIRV package. The Poseidon's range is expected to be about 2900 miles. The new Minuteman weighs 76,000 pounds, slightly heavier than the Minuteman II, and has a more powerful third stage that allows it to handle the heavier multiple payload. It will reportedly be able to carry three warheads with a range of about 8000 miles. The Pentagon has said that both missile systems could be deployed in the early 1970's, following a series of additional test flights. (*New York Times*; 17 August 1968)

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Following their successful test of a thermonuclear device the French lost no time in predicting that they would have missiles with thermonuclear warheads in a few years. French Defense Minister Messmer presided at a news conference at which it was announced that the yield of the French thermonuclear device was about two megatons, and that this was exactly what the designers had planned. The French blast was described as exceptionally "clean" (meaning relatively free of the radioactive debris associated with fission products). It was confirmed that the French device consisted of a fission trigger using enriched uranium, with lithium and deuterium as fuel for the fusion process. (*New York Times*; 28 August 1968)

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There is concern about the Army's storage of nerve gases near Denver. A seven-member panel of scientists and teachers, many from the University of Colorado, say they fear that the gases stored near Denver pose a threat to the lives of most residents of the metropolitan area. The group said that the aboveground tank storage of the lethal gases at the Rocky Mountain Arsenal should be studied by the State legislature and the Congress and that a decision should then be made "on whether to request the Army to eliminate the hazard."

NEWS ITEMS — Continued

The panel's report was based in part on an Army Chemical Corps test last March 14th at the Dugway Proving Ground in Utah which apparently resulted in the death of some 6000 sheep. (See previous NEWSLETTERS). The panel noted that the nerve gases are GB, a "non-persistent" agent, and VX, a "persistent" agent that remains lethal for days after dispersal. Both types are believed to be stored in great quantity at the arsenal. The panel estimated that there were more than 100 steel storage tanks at the arsenal with each cylinder containing enough nerve gas to kill one billion people. The panel argued that the most serious threat to the Denver area lies in the possibility of a plane crash since a portion of the arsenal is under the main north-south traffic pattern of Denver's Stapleton International Airport. There was no comment on the report from Army officials at the arsenal. Previously the Army had suggested that in the event of an accidental tank failure on the arsenal property the nerve gases would be dispersed harmlessly on the ground. (New York Times; 18 August 1968)

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On August 24, France detonated her first hydrogen bomb, joining the U.S., the Soviet Union, Britain, and Communist China as the world's fifth thermocuclear power. The French device was exploded suspended from a balloon over Mururoa Atoll, 800 miles southeast of Tahiti. The U.S. exploded its first hydrogen weapon in November 1952 and it has known that the French were working on similar nuclear bombs over several years.

Neither France nor Communist China has signed the limited test ban treaty banning nuclear explosions in the atmosphere. Although the French said they had taken extensive precautions to prevent harmful radioactive fallout from their explosion, thousands of South Sea Islanders were fearful the explosion would kill fish in a wide area of the Pacific and ruin their main industry.

France has forged ahead steadily in its nuclear armament development program since its first nuclear test in the Sahara in 1960, although in the particular area of fusion as opposed to fission weapons, Red China appears to have made more rapid progress than France. (New York Times; 25 August 1968)

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There is increasingly evidence that the Red Chinese cultural revolution has upset and slowed down that country's nuclear development program. One indicator of such a lag is the fact that the Chinese have not conducted a successful nuclear explosion for the last fourteen months. Since the

last successful blast in June 1967, the ideological purgings and factional tensions of the cultural revolution have apparently extended to agencies concerned with nuclear bomb and missile development. Political attacks on prominent Chinese scientists apparently violate the rules of the cultural revolution adopted in 1966 whereby specialists in the nation's defense program were to be exempt from the ideological rigor of the revolution. (New York Times; 25 August 1968)

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The nuclear-powered freighter Savannah will receive her first "refueling" after six years of operation. The world's first commercial vessel with nuclear power has been 330,000 nautical miles in the last six and a half years. A 600-foot vessel, she has used 119 pounds of nuclear fuel, U-235. It is estimated that had she been a conventionally powered ship she would have burned more than 95,000 tons of oil.

Retired Navy Admiral John M. Will, who is chairman of American Export Isbrandtsen Lines which operates the Savannah, took advantage of the occasion of the Savannah's first refueling to reiterate his conviction that the U.S. is making a serious mistake in not proceeding with the nuclear ship building program. He noted that over an expected ship "life" of 20 years, nuclear-powered ships, while initially costing more, will save much of the capital outlay in cheaper fuel cost. The Savannah will be refueled in one week in Galveston, Texas. Four of the reactors, 32 fuel elements will be replaced, and the remaining 28 elements, which are not yet completely exhausted, will be reshuffled in the core. This will extend the useful life of the plant about three years. (New York Times)

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American oceanographers have been scouting the sea floor more than a mile under the ocean to find out if man's research engineering centers—and possibly military bases—are practical. The surveys are being made under the direction of the Environmental Science Services Administration. One object of the test is to find out if the subsurface sediments are strong enough to sustain structures that might be built upon them. Results obtained off the Bahamas in May at a depth of 5520 feet indicate that the sediments were stronger than believed earlier. Peaceful uses for under-sea bases include studying marine life, drilling for petroleum, mining ores, and laying pipe lines.

In late July, President Johnson urged the seventeen-nation disarmament conference in Geneva to consider barring the use of the seabed as a hiding place for nuclear missiles. (New York Times; 1 August 1968)

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