F. A. S. NEWSLETTER

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DEFOLIANTS UNDER SUSPICION

The following letter appeared in the New Yorker magazine of 14 March 1970, and was dated 5 March 1970.

DEAR SIRS

In an article that appeared in *The New Yorker* on February 7th, I wrote that Dr. Lee DuBridge, the President's science adviser, issued a statement last October at the White House saying that because a laboratory study had shown a "higher than expected number of deformities" in the fetuses of mice and rats exposed to the herbicide 2,4,5-T, agencies of the United States government would take action to restrict the use of that substance in this country and in Vietnam, where it was being used in extensive military defoliation operations. This action, Dr. DuBridge announced, would include the cancellation, by January 1st of this year, of Department of Agriculture permits for the use of 2,4,5-T on some American food crops unless the Food and Drug Administration had by then been able to determine a safe concentration of the herbicide in foods. Dr. DuBridge further announced that the Department of Defense would thenceforth "restrict the use of 2,4,5-T to areas remote from the population" in Vietnam. His statement added that these actions and others "will assure the safety of the public while further evidence [of the alleged harmful effects of 2,4,5-T] is being sought."

Four months have passed, and 2,4,5-T is still being used as widely as ever. The Department of Agriculture has yet to cancel its permits for the use of the herbicide on food crops in this country, and the Department of Defense is continuing to use it in populated areas of Vietnam. In the meantime, officials of the Dow Chemical Company, which is one of the largest producers of 2,4,5-T, have been maintaining that the samples of 2,4,5-T used in the study cited by Dr. DuBridge, which was done by the Bionetics Research Laboratories, of Bethesda, Maryland, were uncharacteristic of the 2,4,5-T currently being produced, because the material tested by Bionetics—which did come from Dow—was contaminated to an unusual extent by a toxic substance identified as symmetrical 2,3,6,7-tetrachlorodibenzo-*p*-dioxin. This contaminant, usually called dioxin, was alleged by the Dow people to be present in the Bionetics samples at a concentration of approximately twenty-seven parts per million, and they claim that the 2,4,5-T that Dow is currently producing contains the dioxin contaminant in concentrations of less than one part per million. The Dow people maintain that their currently produced 2,4,5-T does not appear to have the effect of deforming rat fetuses. In January, a Dow official told the Department of Health, Education, and Welfare, "We strongly urge that action concerning the status of 2,4,5-T be held in abeyance until [Dow's] testing program is completed [in] April." The United States government's failure so far to place the promised restrictions on the use of 2,4,5-T in this country may in part be attributed to this plea.

Because of the seriousness of the issues involved, it seems to me that the government's failure to act on the use of 2,4,5-T here and in Vietnam calls for much fuller public discussion. Even though the dioxin contaminant may now be present in 2,4,5-T in what the Dow Chemical Company apparently considers to be no more than tolerable amounts, the substance is of such potency that its release even in small concentrations must prompt deep concern. In the presumably more heavily dioxin-contaminated samples of 2,4,5-T that were used in the Bionetics work, the smallest dosages

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F.A.S. STATEMENT ON CHEMICAL WARFARE AND U.S. RATIFICATION OF THE GENEVA PROTOCOL OF 1925

Dr. Herbert F. York, Chairman of the Council of the Federation of American Scientists today (May 20) released the following FAS statement on the use of chemicals in Vietnam and on the Geneva Protocol with these comments:

"When I was director of Defense Research and Engineering under President Eisenhower, I believed that some chemical and biological weapons, especially the non-lethal variety, could be usefully incorporated into our defense arsenals and might, in some degree, make war more humane. I have come to realize that the situation is very much more complicated than I had then thought it was. Indeed, these weapons generally make war more inhumane especially when used in conjunction with conventional weapons. I consider my earlier support of biological and chemical weapons to have been perhaps by biggest mistake of that period. I therefore am especially pleased, as Chairman of the Council of the Federation of American Scientists, to endorse the ideas and recommendations set forth in this statement of the FAS Council."

The Council of the Federation of American Scientists, representing 2,000 scientists and engineers concerned with arms-control and public policy implications of technology, today urged the Administration to cease the use of anti-personnel and anti-plant chemical weapons in Vietnam and to submit the 1925 Geneva Protocol prohibiting gas and germ warfare to the Senate without any restrictions that would jeopardize its effectiveness.

The F.A.S. has applauded the wise initiative of the President in totally renouncing biological weapons and his decision to send the Geneva Protocol to the Senate for advice and consent. It is vitally important in ratification of the Protocol that the U.S. not open loopholes for harassing gases and herbicides. To do so would weaken the restraints against gas warfare that were upheld without violation throughout World War II and the Korean War.

In Vietnam, a dangerous departure from our traditional policy has been allowed to occur and to escalate. The main anti-personnel chemical used is the harassing agent CS, an eye and lung irritant. CS procurement for Vietnam expanded from 253,000 pounds in 1965 to 6,063,000 pounds in 1969. During the same period, the types of gas weapons in use escalated from hand-grenades to 105 and 155 mm artillery shells and nearly 20 other newly developed tactical gas munitions for air and ground delivery. Regular enemy troops are now widely equipped with Chinese gas masks and they are using CS against us with limited but increasing frequency. While the military utility of gas decreases sharply as the enemy obtains masks, it sets the stage for further escalation and stimulates worldwide military interest in the acquisition of chemical weapons.

Herbicide spraying of crops and forest lands in Vietnam increased from 5,700 acres in 1962 to 1,330,000 acres in 1968. Approximately 20 per cent of all the forests in Vietnam have been chemically defoliated. This sets a dangerous precedent for massive destruction of the environment for military purposes. Recently, the spraying of forests has been suspended because of concern that the chemicals used for this purpose may cause human birth defects. However, it appears that spraying of crops continues. This tactic does little to harm enemy soldiers, but has inflicted unnecessary suffering on

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BOOK NOTES

The McKay Co. has published *Century of Mismatch* by Simon Ramo, a discussion of the problems of technology and society. Dr. Ramo has an optimistic view of how society can be reshaped to compromise with technology, although his view of the present is that "we're losing." He has outlined ideas for a national medical data center where computers would make diagnoses, electronically controlled highways, and other innovations. Although these notions have been put forth before, the main point of the book is to discuss how these technological changes can fit into the social structure.

Robert Pickus and Robert Wioto have written a book entitled *To End War,* published by A World Without War Council. The book is described by its authors as an introduction to ideas, organizations, and current books, and for the most part it is bibliographic, covering the field of peace research thoroughly.

The Coalition on National Priorities held hearings on March 25, 1970 at the Statler-Hilton Hotel in Washington, on *An Alternate Defense Budget* for the United States. The results of the hearing have been published by the Coalition. The Panel of Inquiry consisted of Joseph S. Clark, Dr. Adrian Fisher, and W. Willard Wirtz. Clark was formerly a senator from Pennsylvania and now heads the Coalition on National Priorities. Fisher is Dean of the Georgetown University Law School. Wirtz was formerly Secretary of Labor and now practices law in Washington. The witnesses were Dr. Robert N. Anthony, professor of Management Control at Harvard University; Paul Warnke, formerly Assistant Secretary of Defense for International Security Affairs; Robert S. Benson, Western Regional Director, National Urban Coalition, and formerly Assistant to the Assistant Secretary of Defense (Comptroller); Dr. Seymour Melman, Professor of Industrial Engineering at Columbia University; and Dr. Leonard Rodberg, Associate Professor of Physics at the University of Maryland, and formerly Chief of Policy Research in the Science and Technology Bureau of the U.S. A.C.D.A *An Alternate Defense Budget* is published in two sections, one the *Report of the Panel of Inquiry* and the other the *Testimony of Witnessees.*

The American Chemical Society has printed a long and comprehensive article on the problem of solid waste disposal in the *Environmental Science and Technology* issue of May 1970. The report covers aspects of the problem, management of disposal, reutilization of solid waste, and legislation proposed to deal with the problem.

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Chairman.....Herbert F. York

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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.

LEAD MAY AFFECT WEATHER

The lead from automobile exhaust may be affecting the weather, says Dr. Richard D. Cadle of the National Center for Atmospheric Research in (April 20) *Chemical and Engineering News,* official news organ of the American Chemical Society.

This possibility has occurred to environmental scientists as a result of the observation of widespread cloud formations over cities, explains Dr. Cadle, who is head of the Center's chemistry department in Boulder, Colo. Clouds to windward of cities consist of water droplets, whereas clouds downwind from cities are near freezing and contain ice crystals formed on particles from the cities—probably lead particles, he comments.

"One theory, although it's now much more than a theory, is that lead compounds given off by automobiles react with traces of iodine in the air and form lead iodide," Dr. Cadle says. "This compound makes beautiful freezing nuclei for the formation of snowflakes. We would like to investigate whether an increase in the number of freezing nuclei can be attributed to the city, and what effect this may be having on the weather."

Laboratory experiments reveal lead iodide to be especially effective in initiating freezing—almost as effective as silver iodide. The two compounds, which are similar chemically, have both been used to "seed" clouds in weather modification attempts.

Scientists study atmospheric particles as tracers to follow the movements of air masses in surveys of worldwide pollution, Dr. Cadle says. A group in his department is following the movement of particles in the atmosphere near the earth, in the stratosphere, and around the earth from the Amazon to the Antarctic. They use balloons, rockets, and airplanes to collect samples at different levels. A cooperative study with other government agencies is scheduled to measure the path of pollution-causing particles and gases downwind from an American city.

Particles are introduced into the atmosphere by natural phenomena such as dust storms, forest fires, and volcanic action, as well as by the smokestacks and automobiles of man. It is Dr. Cadle's opinion that it is very important to investigate all sources of particles, including volcanoes, so that a better comparison can be made of the relative importance of man's and Nature's contributions to atmospheric pollution.

In connection with any possible health hazard from the lead compounds that automobiles send into the atmosphere, Dr. Cadle believes there is reason for alarm, but he warns that quick solutions could grow into problems of an entirely different kind. He suggests, for example, that petroleum refiners who hope to replace leaded gasoline with high-aromatic fuels should look at least twice before they leap.

"It's conceivable that some of these aromatics could lead to the formation of carcinogenic by-products in the combustion process, although I don't know of any hard evidence to support that idea," he says. "Nevertheless, aromatic compounds generally are toxic, irrespective of whether or not they're carcinogenic.

"Also, certain aromatic compounds have been found to be a couple of orders of magnitude more severe as eye irritants than the peroxyalkyl nitrates formed from conventional gasolines. What I'm really saying here is that in the whole idea of air pollution control, we shouldn't rush ahead with one solution before trying to anticipate the larger problems it may create."

(American Chemical Society news release, 21 April 1970.)

FAS STATEMENTS ON ENVIRONMENT

A resolution Concerning the Redirection of National Capabilities for Scientific Research and Development toward Solving Problems of Environmental Quality.

(As passed by FAS Council—April 27)

WHEREAS:

1. Our environment is deteriorating ever more rapidly because of unanticipated effects of technological developments as well as overexploitation of environmental resources;

2. The National Science Foundation, originally conceived by Congress as an agency for developing and implementing a national science policy, has never been adequately funded for that purpose;

3. Congress will soon be asked to vote on proposals for developing a capability for technology assessment at the federal level;

4. These proposals at present provide only minuscule funding, sufficient only for information gathering for Congressional purposes;

THEREFORE BE IT RESOLVED that the Federation of American Scientists urges:

1. That adequate funding be provided to develop a comprehensive, continuing program of research and development to devise and revise systems of resource management and systems of environmental surveillance which will minimize the deleterious impact of industrial and domestic technology on the environments of America;

2. That a high national priority be accorded to these endeavors.

ON RADIATION HAZARDS

New information has become available recently concerning the effects on the population of low-level radiation in the environment. This includes not only technical facts but opinions of knowledgeable scientists. The accompanying information statement provides background material and summarizes the recent developments. The two most improtant points are:

(1) There is an increasing recognition that prolonged low-level environmental radiation has harmful public-health effects, the chief question now being the details including the magnitudes of the effects rather than their exisence.

(2) It is illogical for the responsibility for protection of the public from radiation hazards to be invested in the same agency whose mission is the promotion of the uses of atomic energy on a large scale.

We feel that it is essential that there be initiated promptly a high-level comprehensive review of the technical facts in this matter by a competent and impartial group of scientists, and a reassignment of the responsibility for protection of the public from radiation effects. Congressional action will almost certainly be required, and the investigations should be initiated by the Congress. Accordingly, the FAS should direct a strong recommendation to the appropriate congressional channels to achieve this.

Furthermore, the FAS should urge vigorously the avoidance of any additional introduction of radiation and radioactivity into the environment when this can be controlled, until the present guidelines on permissible population exposure are reviewed. In particular, the projected "Sturtevant" cratering experiment should be postponed until its potential effects on the population can be fully explored and made known.

(*adopted at 26 April Council meeting*)

ON ABORTION

The FAS believes that current abortion laws in all states—except the few which have recently repealed them—should be promptly changed because: (1) In a time of unprecedented and dangerous population increase they force unwanted children to be brought into the world despite the wishes of the mother; (2) They interfere with the right of a woman to obtain the medical treatment of her choice; (3) They drive women to illegal abortionists and to use abortion methods which are extremely dangerous; and (4) They further lower the quality of life of the poor, who are least able to obtain the illegal or semilegal abortions which are available to some. FAS urges that discriminating and punitive abortion laws be repealed so that abortion can be governed by the general laws regulating medical practice and can thereby be made widely available, easily accessible, and safe.

ON CBW

Statement of Position by the Council of the Federation of American Scientists

President Nixon's November 25th statement on Chemical and Biological Warfare policy, though commendable in major respects, implied that official U.S. policy considers herbicides (defoliants) and harassing agents (tear and nausea gases) to be outside the scope of the Geneva Protocal of 1925. This suspicion has since been confirmed by other official statements and by United States' actions in the United Nations. Since most of the signatories of the Geneva Protocol have always considered these weapons to be included within its provisions and since the General Assembly of the United Nations by a recent vote of 80 to 3 formally stated that they are included, the FAS Council voted unanimously to urge the administration that the Geneva Protocal of 1925 against Chemical and Biological Warfare be submitted to the Senate with **no** weakening reservations and that it be made clear in the letter of transmittal that: (1) The U.S. considers war usage of harassing agents (tear and nausea gases) and herbicides to be included in the meaning of the Protocol and (2) The U.S. will immediately cease using such agents in Southeast Asia.

The FAS has applauded the initiative of the Nixon Administration in renouncing totally the use of Biological weapons and the first use of lethal and incapacitating Chemical weapons. It is vitally important in the prospective submission and ratification of the Geneva Protocol of 1925 that the U.S. not open specific loopholes for tear gases and herbicides which would weaken the restraints against gas warfare that withstood the tremenduos pressures of World War II and the Korean War without violation.

These U.S. moves in recent months to firm up the "fire break" against germ and gas warfare are commendable, but their effect is seriously undermined by our extensive use of herbicides and tear gases in Vietnam. In several areas, uses of these weapons have reached the point where our troops and NVN regulars keep masks at hand, and the dispersal weapons—from grenades up to 155 mm mortar shells—are not considered extraordinary. Use of our main harassing agent, the lung irritant CS, has vastly esclated. CS procurement expanded from 253,000 lbs. in 1965, when first reports of Vietnam usage emerged, to 6,063,000 lbs. four years later. The military value of this gas is questionable now that increasing numbers of the enemy possess gas masks. Herbicide spraying of South Vietnam increased from 5,600 acres in 1962 to a high of 1,707,700 in 1967. The ecological damage and dangers from this practice are now more widely recognized.

It would be to our interest, not only in Vietnam, but anywhere, for these agents to be eliminated from all arsenals. The escalation from small use to larger use is so easy that safety lies in refraining strictly from any war usage of chemical weapons. We urge the President to complete his initiatives on these matters by aligning our country with nearly all the rest of the nations of our world who consider herbicides, tear, and nausea gas as chemicals whose use is banned under the Geneva Protocol of 1925.

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of 2,4,5-T that the test animals were given caused extensive deformities in fetuses. In more recent studies of the dioxin contaminant, conducted by Dr. Jacqueline Verrett, of the Food and Drug Administration (who earlier was responsible for revealing the carcinogenicity of cyclamates), extensive teratogenic, or fetus-deforming, effects were discovered in chick embryos when the dioxin, or a distillate predominantly consisting of it, was present at concentrations of little more than a trillionth of a gram per gram of the egg. The magnitude of this effect on chick embryos may be gathered from the fact that, according to Dr. Verett's studies, the dioxin appears to be a million times as potent a fetus-deforming agent as the notorious teratogen thalidomide was found to be in tests on chicks. Of course, chick embryos are far down the biological ladder from human fetuses, and they are also extremely sensitive to many substances. But even if, for theoretical purposes, we reduced the teratogenic power of the dioxin, as shown in Dr. Verrett's chick-embryo studies, approximately a million times, we would *still* have to consider that we were dealing with a substance as teratogenically potent as thalidomide. That the United States government permits the presence, even in minute amounts, of such a substance in herbicidal mixtures to be sold for spraying on food crops and on suburban lawns—where some of the chemical may enter shallow wells and other drinking-water supplies—is hardly reassuring. And it is particularly disturbing when one reflects that in the quarter of a century in which 2,4,5-T was used prior to Dr. DuBridge's announcement not a single regulatory agency of the United States government, not the Department of Defense—which has been spreading huge quantities of 2,4,5-T on vast areas of Vietnam—and not, as far as is known, the researchers for any one of the half-dozen large American chemical companies producing the material had ever so much as opened up a pregnant mouse to determine whether 2,4,5-T or the dioxin contaminant in it did any systemic or pathogenic harm to the fetus. Several studies of the sort are now under way, but the United States government still seems to take the position that the 2,4,5-T produced by Dow and other large chemical companies should be considered innocent until it is proved to be otherwise. Meanwhile, 2,4,5-T is being sprayed on certain crops and on areas where it may come into contact with human beings, cattle, and wildlife. In Vietnam, it is being sprayed by the military in concentrations that average thirteen times as great as those that the manufacturers themselves recommend as safe and effective for use in this country.

It is true that the teratogenicity of dioxin—as distinct from dioxin-contaminated 2,4,5-T—has not yet been established in tests conducted on experimental animals of mammalian species. However, the direct toxic, or body-poisoning, effects—as distinct from fetus-deforming effects—of dioxin are known to be very high both in animals and in human beings. In past studies on rats, dosages of forty-five millionths of a gram per kilo of the mother's body weight have been found to kill fifty per cent of the offspring. When dioxin was given orally to pregnant rats in recent tests, it was found, on preliminary investigation, to kill all fetuses with dosages of eight millionths of a gram per kilo of the mother's body weight, and to damage fetuses with dosages of a half-millionth of a gram per kilo.

Further, the effects of dioxin on human beings, even in small dosages, are known to be serious. In the past, in plants manufacturing 2,4,5-T an illness called chloracne seems to have been widespread among the workers. In the mid-sixities, Dow was obliged to close down part of a 2,4,5-T plant in Midland, Michigan, for some time because about sixty workers contracted chloracne as a result of contact with dioxin, which seems to be always present in varying degrees during the process of manufacturing 2,4,5-T and in the finished 2,4,5-T itself. The symptoms of this disease include extensive skin eruptions, disorders of the central nervous system, chronic fatigue, lassitude, and depression. Workers at a 2,4,5-T plant in New Jersey run by another company suffered similar symptoms in the mid-sixties, and six years later some of them were reported to be still suffering from the effects of the disease. In Germany, since the mid-fifties, workers in factory after factory producing 2,4,5-T and polychlorophenolic compounds have been afflicted with chloracne after absorbing apparently only minute amounts of the dioxin contaminant; their symptoms have been described in several medical papers as including liver damage, nervous and mental disorders, depression, loss of appetite and weight, and markedly reduced sexual drive.

A few weeks ago, when a reporter approached an official in Dr. DuBridge's office for information on 2,4,5-T he was told that he would be given White House coöperation "only to a certain extent," because the official didn't want "wild speculation" stirred up. He cited as an example of "wild speculation" the recent controversy over the birth-control pill, which, he said, had "caused millions of women to get hysterical with worry." The reporter replied that he didn't think the analogy between 2,4,5-T and the Pill was a particularly good one, for the reason that a woman using the Pill could employ alternative methods of contraception, whereas a Vietnamese woman exposed to herbicidal spray put down by the American military had no choice in the matter.

But perhaps the comparison between 2,4,5-T (and its dioxin contaminant) and commonly used pills is worth pursuing. Suppose that such a dangerous substance as dioxin were found to be contained in a pill offered for human consumption in this country, and suppose that the contaminant were present in such minute amounts that an adult following the prescribed dosages might ingest a hundredth of a millionth of a gram of the contaminant per day. There is no doubt whatever that, according to existing Food and Drug Administration standards, the F.D.A. would immediately ban production and sale of the pill on the ground that it was highly dangerous to public health; in fact, the amount of such a potent contaminant that the F.D.A. would permit in a pill under the agency's present policy on toxicity would almost certainly be zero.

While 2,4,5-T, with or without the dioxin contaminant, doesn't come in pill form, it may be worthwhile to try to calculate, on the basis of a hypothetical pill, how much 2,4,5-T (and dioxin) a Vietnamese woman living in an area sprayed by the American military might ingest in a day. It has already been calculated by reputable biologists that, if one takes into account the average amount of 2,4,5-T sprayed per acre in Vietnam, and also takes into account a one-inch rainfall—such as is common there—after a spraying, a forty-kilo (about eighty-eight-pound Vietnamese woman drinking two litres (about two quarts) of 2,4,5-T-contaminated water per day could be ingesting about a hundred and twenty milligrams (about a two-hundred-and-fiftieth of an ounce) of 2,4,5-T a day. If the 2,4,5-T contained the dioxin contaminant at a level of one part per million—which is what the Dow people say is the maximum amount present in the 2,4,5-T they are currently producing—the Vietnamese woman would be absorbing a little over a tenth of a microgram of dioxin per day, or ten times the amount of dioxin entering the system of an adult from the hypothetical pill that the F.D.A. would certainly find dangerous to human health. Further, if this Vietnamese woman were to conceive a child two weeks, say, after the spraying, the weight of the dioxin that by these same calculations would have then accumulated in her system (the evidence thus far is that dioxin accumulates in mammalian tissue in the same manner as the chlorinated hydrocarbons, such as DDT) would be more than the weight of the just-fertilized ovum. Considering the existing evidence of the frightening degree of teratogenicity of the dioxin in chick embryos and its highly toxic effects on mammalian fetuses, the presence of this much dioxin in a mother's body at the very beginning of a human life surely has ominous implications.

Now, what about the safety of 2,4,5-T itself? Admittedly, the dioxin contaminant seems to be a residue from one stage

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of its manufacture. But if by some future chemical miracle the very last trace of dioxin could be removed from the finished 2,4,5-T, would the resultant "pure" 2,4,5-T be harmless? The fact seems to be that even then 2,4,5-T, as produced in this country, would have to be viewed with suspicion, for the breakdown products of 2,4,5-T, when subjected to heat and other conditions, are themselves capable, according to a number of responsible biologists, of producing dioxin. Given this potential, the ultimate folly in our defoliation operations in Vietnam was possibly achieved during 1965 and 1966, when the military made large-scale efforts in two defoliated areas to create fire storms—that is, fires so huge that all the oxygen in those areas would be exhausted. The apparent intention was to render the soil barren. (A fire storm would also, of course, have the result of burning or suffocating any living beings remaining in the area.) Operation Sherwood Forest, conducted in 1965, was an attempt to burn a defoliated section of the Boi Loi Woods. In October, 1966, the military began Operation Pink Rose, a similar project. Neither of the projects, in which tons of napalm were thrown down on top of the residue of tons of sprayed 2,4,5-T, succeeded in creating the desired effect; whether they released into the atmosphere dioxin produced by the breakdown products of the 2,4,5-T will probably never be known.

There are also less spectacular ways in which conditions suitable for the release of dioxin in Vietnam may have been created. For example, after areas accessible by road have been defoliated, woodcutters move in to chop up the dead timber, which is then carted off to nearby towns and sold as firewood. Large quantities of it are said to have been entering Saigon for years. Since the fires are customarily tended by Vietnamese women, and since many of them are certainly pregnant, the hazards to health and to the lives of unborn children surely cannot be ignored.

In the United States, the potential hazards from the present use of 2,4,5-T are considerably less than they are in Vietnam. In the first place, the recommended concentrations of 2,4,5-T for spraying here are, as I have pointed out, about a thirteenth of what the Vietnamese population is sometimes subjected to. And, in the second place, a great deal, if not most, of the 2,4,5-T that would otherwise have been sprayed on American crops and grazing areas has for several years been sent to Vietnam. However, the shortage of 2,4,5-T in this country does not necessarily mean that the potential hazards are at a minimum. The substances known as the trichlorophenols and compounds of pentachlorophenol, which officials of the F.D.A. believe may be chemical precursors of dioxin under certain thermal and other conditions, are used widely in the manufacture of a large variety of consumer products, ranging from paper to laundry starch and hair shampoo. Dow Chemical puts out a whole line of polychlorophenolic chemicals known as Dowicide Products. Monsanto Chemical also puts out a line of pentachlorophenol substances, known as Penta Compounds. Since a very great many consumer products wind up being burned sooner or later, and since the polychlorophenolic compounds are suspected of being capable, under particular thermal and other conditions, of releasing dioxin, the alarming question arises whether, and to what extent, dioxin is being released into the environment through the atmosphere. Pentachlorophenol, used in certain herbicides, is readily decomposed in sunlight, and in its breakdown process a number of products, including chemical precursors of chlorodibenzo-p-dioxin compounds, are produced. Because of these factors, a whole range of pesticides, as well as of herbicides, now must come under suspicion of producing dioxin compounds.

Although the chemical companies that manufacture 2,4,5-T have long taken pride in pointing out that 2,4,5-T itself is quite readily decomposable in soil, the crucial matters of how stable the dioxin contaminant is and to what extent it is cumulative in animal tissue have apparently been neglected. Consequently, the fact that traces of compounds virtually indistinguishable from dioxin have already been detected in this country in the human food chain—in the livers of chickens and in edible oils—clearly indicates that dioxin should be considered a hazard to man. Why, under all these inauspicious circumstances, the production and the use here and in Vietnam of 2,4,5-T has not summarily been stopped by the United States government is hard to understand.

Sincerely,
THOMAS WHITESIDE

CONSTITUTIONAL AMENDMENT

An amendment to change the terms of delegates-at-large will be put to a vote by the membership in the forthcoming election ballot.

Arguments for a Four Year Term:

Under the Present system of two year terms for Council members, twelve—or **one half** of the 24—members are reelected each year from a slate of 18 names. The slate is chosen by a nominating committee, which each year has always had the utmost difficulty finding so many suitable new candidates. In practice, the nominating committee chairman has been reduced to dictating an insufficiently activist (often largely renominated) slate with little or no consultation even with his committee. The required slate has thus been too unwieldy to be chosen in ways that are responsive to the membership. Indeed, an undignified struggle over the choice of the nominating chairman is, in principle, the logical result of a system giving him such influence. As a further result of the two year term, members elected attend, on average, only one meeting (1) and become very little involved in the organization, often not knowing most other council members much less the chapter heads. They are, therefore, neither responsive to the organization nor can be relied upon by the leadership to undertake necessary activities.

If the anticipated FAS renewal campaign is to be successful, on-going projects and significant funds will eventually be supervised by the Council. The present system provides such a rapidly changing and indifferently interested Council as to vest, in practice, all such power in th organizations permanent officers—only two of which are elective. The result is impropriety, instability, and ineffectiveness. The answer is more carefully selected and more deeply committed persons. This requires a longer term.

Arguments against 4-year Council Term:

An extension of the term of Council members to four years will build into FAS a rigidity which can greatly reduce its effectiveness in this period when the issues, and even the appropriate political approaches, change almost yearly. With a growing trend among younger scientists in favor of more flexible organizational structures, this hardly seems the time to be making the Council a less responsive organ. In fact, ways must be found to tie the work of the Council more closely to the activities of the local chapters, so that the national organization, and its newly-strengthened Washington office, can more effectively represent its members. Lengthening the term of Council members is, instead, a step backwards from making FAS more responsive to its membership.

Further, now that the Chairman will serve immediately upon his election (rather than waiting a year, as in the past), he should be able to work with a Council whose membership is not composed predominantly of holdovers from three previous years.

DDT BAN VIEWED WITH ALARM IN UNDERDEVELOPED COUNTRIES

The following is an abridgement of an article which appeared in the Wall Street Journal of 16 February 1970. It was written by Ray Vicker.

"DDT is dangerous. It pollutes the envrionment, kills some animals and may be harmful to human beings. Its use should be banned or severely restricted."

That's the way many scientists and government officials see it in the United States, Canada, Russia, Japan, West Germany, Norway, Denmark, Sweden, the Netherlands and Hungary.

"DDT is the most important lifesaver known to man. If it is banned, millions of impoverished people will die from crippling diseases—if they don't starve to death first."

That's the view of many scientists and government officials in Ceylon, Brazil, India, Greece, Mexico, the United Arab Republic and dozens of other not-so-prosperous countries.

It is the former group that has been heard from most lately. Indeed, in each of those 10 countries partial bans against the use of the powerful pesticide have been instituted in the past year or so. Scientists who oppose the use of DDT say large doses sometimes kill whole populations of fish, birds and small animals. They say that it persists in fields and streams, retaining its toxicity for up to half a year, far longer than most pesticides, and that it builds up in the systems of animals. Indeed, claim the critics, DDT imperils the whole balance of nature and thus threatens every living creature, man included.

DDT and related compounds account for well over half the insecticides used for crop protection in poor lands. FAO estimates that without DDT-like compounds, 50% of the cotton production in developing countries would be chewed up by insects. In Brazil, the guava crop depends heavily upon DDT spraying.

In India, where insects eat 15% to 30% of all farm crops each year, the government and UN consultants are working to increase cropland protected by pesticides—mainly DDT—to 20% of the total from 10%. That measure alone, it's expected, will bring India an extra 1.4 million tons of rice, 100,000 tons of peanuts, 65,000 tons of sorghum, 250,000 tons of sugar, 46,000 tons of corn and 200,000 tons of potatoes every year.

To cut use of DDT and perhaps soften the opposition to it, FAO and WHO are promoting what they call "integrated pest control"—a system that uses natural enemies of bugs and a variety of farming methods, along with reduced amounts of pesticides, to wipe out crop-eating insects.

But WHO officials say there's no substitute for the massive doses of DDT used for disease prevention. "The concept of malaria eradication rests completely on continued use of DDT," says M. G. Candau, director-general of WHO. DDT is "irreplaceable in public health," Mr. Candau says, and "limitation on its use would give rise to grave health problems in the majority of developing countries."

WHO still rates malaria as "the world's greatest single cause of disablement." The mosquito-borne disease saps the strength of its victims and in about one case per hundred causes death. In tropical countries, it causes 20% of all deaths and accounts for 10% of infant mortality. Indeed, the man who discovered DDT—Swiss researcher Paul Mueller—won the Nobel Prize in 1948 after it became apparent the chemical could save millions of lives.

CHEMICAL WARFARE (continued from page 1)

hundreds of thousands of non-combatants. It arouses great hatred among peasants whose crops are destroyed, thus foolishly generating recruits and support for the enemy.

Chemical and biological weapons have the potential of greatly increasing the level of death and destruction in conflicts of all kinds, from guerrilla wars to strategic attacks on great powers. Because soldiers can be protected against such weapons far more readily than can civilians, the main threat is to non-combatants. The United States, with its great wealth stands only to lose if these cheap weapons of mass destruction should come into general possession and use. Our overriding objective should be to prevent the proliferation of chemical and biological weapons and to bolster the psychological and legal barriers against their use. Recently, the General Assembly of the United Nations voted 80 to 3 to affirm that all chemical weapons, including herbicides and tear gases, are prohibited by the Geneva Protocol. It would be tragically against our own best interests to attempt to change the long-standing rule of "no gas" in war. We urge the President to insure the effectiveness of his recent initiatives in these matters by returning to our traditional standard and ratifying the Geneva Protocol without restrictions.

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