

F. A. S. PUBLIC INTEREST REPORT

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THIS ISSUE:

SOVIET CIVIL DEFENSE

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ARE WE THREATENED BY SOVIET CIVIL DEFENSE?

Evidently, there will always be among us those who reject the notion that deterrence is adequate. In the late fifties, exaggerated (missile gap) estimates of Soviet missile production led to fears that the U.S. retaliatory force of several hundred bombers might be destroyed. After 1,000 land-based and 656 submarine-based missiles were produced (and the gap exposed as a myth) the fearful turned to charging that the Soviet Union might be building an anti-ballistic missile system which — in concept if not in practice — might destroy in flight virtually all surviving U.S. retaliatory missiles.

We bought additional certainty in two quite different ways: MIRVing our missiles to penetrate any such defense and negotiating an agreement precluding significant anti-ballistic missile construction.

Now the same school of fear charges that the Soviet Union, with civil defense measures (especially city evacuation), might consider "acceptable" the destruction wreaked by several thousand (thousand!) nuclear warheads which, it is conceded, could not be destroyed in any Soviet first strike.

The Scenario Spelled Out

The complete scenario is rarely spelled out in detail, the better implicitly to overlook its problems. But it runs something like this: in a crisis, the Soviet Union evacuates all of its cities and then threatens to fire its missiles at our locatable forces (1,000 Minutemen in Europe, etc.). Its leadership supposedly asserts that an evacuated Soviet population could rebuild the cities and industry destroyed by upward of 4,000 surviving American retaliatory warheads and, claiming that we could not, secures thereby some bargaining advantage.

Let us, at the outset, overlook the fact that the evacuation — which would take days, thereby alerting our forces — could only take place in good weather, and could only be maintained a short time, undermining enormously its value as a bargaining agent.

Let us overlook the fact that the engineering calculations of this school assume, among many other things, military discipline in movement, and in subsequent use of fallout shelters, by the entire population.

Let us also ignore the extreme difficulty of finding a crisis to which such apocalyptic methods, with their inevitable aftermath of coldest war, would be appropriate.

Above all, let us pass over the fact that the threat

could only be made once since — assuming general nuclear war did not erupt — the United States would subsequently leap into a Sparta-like frame of mind that would easily generate such weapons as would make any renewal of this threat quite inconceivable.

Let us, instead, address the ultimate Strangelovian fear. Is such a threat credible — that is to say, could such an attack after evacuation be rationally pondered by a political leadership?

The Soviet leadership, no matter how diabolically construed, would need assurances for the survival of the Soviet Union as a modern economic, social and political entity.

Nuclear attack planners would have to concede that virtually all of the Soviet cities and small towns would be leveled. They could not confidently predict that the surviving population, evacuated or not, would emerge from the first winter as a viable entity: medically, nutritionally, or economically.

With the population's disease resistance lowered by radiation, with related grim changes in the ecology (e.g., insects, are more resistant than mammals or birds to radiation), and with sanitation enormously disrupted, the survivors could be expected to suffer terribly and unpredictably from plagues and epidemics of all kinds.

With the survival of stockpiled Soviet grain surpluses uncertain, with chronic Soviet agricultural difficulties further exacerbated by fallout, with great uncertainty of supply of needed agricultural inputs, with the uncertainties of climate enhanced by worldwide weapons effects, and with the existing abundance of world food reserves underlined by the absence of American food surpluses, high percentages of surviving Russians would likely starve.

Surviving Industry and Surviving Population

Economically, a certain ratio between survival industry and surviving population is obviously necessary; but this scenario postulates an enormous success in saving people with only scattered success in saving industry. MIRV having increased by a factor of ten the number of separate targets that the U.S. can strike, our targeting capability has greatly outraced any industrial dispersion program which Soviet civil defense planners might have envisaged. Thus these planners would have to project a society, overwhelmed

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— Reviewed and Approved by the FAS Council
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Finally, whatever civil defense program is to be maintained in the United States, nothing could be more inappropriate, politically and strategically, than to cast that program — as these alarmists desire — in the context of a war-game response to a dangerous Soviet civil defense weapon.

Politically, it was a major and decisive error of Kennedy-era civil defense planners that their program was injected into the controversy surrounding the Soviet threat to Berlin. That history shows that no American civil defense program will be acceptable to the public except possibly on the prudential grounds that war might just occur and that, through civil defense, some lives might just be saved.

Strategically, if the Soviet program were to be really documented as undermining our deterrent — which is far from the present case — it would be absurd to recommend that U.S. civil defense could substitute, in redressing that problem, for reestablishing the deterrent.

What in the last analysis would “undermining our deterrent” mean? Need we go down that endless road of weapons aimed at proving that whatever Americans would survive the nuclear war would rebuild more rapidly than whatever Russians would survive? Or can we stop at some notion of “unacceptable damage”?

We are, today, as safe against calculated deliberate Soviet attack as we are going to get; only a desperate or an insane decisionmaker would undertake the risks at issue. To the insane decisionmaker we are already irrevocably vulnerable. What can be said about the desperate?

It can be said that politicians have already decided, in the nuclear age, that it is too dangerous to drive a nuclear power into a desperate corner. If, therefore, a Soviet civil defense program signals the undesirability of pushing the Soviet Union into a corner, then it merely signals something we already knew — and something the Soviet leadership already knows about us. Neither can be “rolled back.” Soviet desperation already had higher risks of producing unwanted war than its civil defense could ever provide of deliberate calculated attack.

We do not know where this debate will lead, or what evidence will be adduced that has not been provided thus far. But on the basis of everything in the public domain at this time, we feel obliged to warn our fellow citizens that exaggerations of the threat we face abroad have consistently led — through overreaction and weaponry spirals — to real diminutions in the safety of our Republic. □

CIVIL DEFENSE — A SOVIET VIEW

The United States Air Force has sponsored the translation of a basic Soviet civil defense text under the title “Civil Defense — A Soviet View” and made it available at the Government Printing Office. The Soviet text is naive, if not deliberately misleading, in its introduction. For example:

“Thanks to the relentless efforts of the Party and the

government, in a relatively short time the missile forces have been converted into a powerful *shield* against the cunning intent of aggressors. Immediate *destruction* of the enemy’s means of attack is effected by antimissile and antiaircraft defense. Soviet air defense forces, coupled with the air force, and air defense troops of the ground forces and the navy, reliably protect our country from enemy strikes.

“However, it is not possible to guarantee that *some* of the enemy missiles will not penetrate our air defenses.” (p. 5) Emphasis added

After discussing how modern nuclear war would attack not only armed forces but cities, industrial plants, etc., the text is sometimes plain silly:

“Destroying the morale of the population is one of the main goals of such a war.”

The text refers to civil defense teams performing rescue operations as if they were fire brigades faced with V-2 bombs whose arrival could not be “completely” excluded:

“Performing rescue operations is one of the vital tasks of civil defense. Antiaircraft and antimissile defenses notwithstanding, it is still impossible to completely exclude the possibility of nuclear strikes on cities. Thus, civil defense formations must be ready to immediately go to the rescue of nuclear blast victims.” (p. 10)

In fact, assuming, as Soviet civil defense workers must, that fallout occurs, the notion of going to the immediate rescue of nuclear blast victims is a form of pointless suicide. Rescue workers would be bottled up in shelters before any significant rescue could be effected.

After listing a number of injunctions to civil defense workers, including the preparation of various kinds of citizens at “work in centers of destruction,” the text observes that civil defense makes it possible:

“. . . not only to reduce the number of casualties, but also to preserve items of material and cultural value, and to *guarantee uninterrupted work in rear areas.*” (emphasis added)

The notion of uninterrupted work in rear areas is a bizarre example of doctrinal lag. It shows the Defense Ministry refiguring World War II.

One reason for whatever emphasis exists upon civil defense in the Soviet Union is the felt plausibility of other than nuclear wars — wars with which civil defense might be able to cope. The very first page of the Soviet foreword to this text defines civil defense in these terms and refers only secondarily to nuclear war:

“Civil defense is a system of national defense measures directed toward protecting the population, creating necessary conditions for maintaining operational stability of the national economy in wartime, and, *if the enemy uses weapons of mass destruction, performing rescue and urgent emergency-restoration work.*” (emphasis added)

In short, reading the text, one gets a very different, much less fearsome appraisal of Soviet intent than that provided by Leon Gouré. Professor Gouré has been following Soviet civil defense for a quarter of a century, first at RAND

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*This reference suggests the Soviet Defense Ministry is thinking as some of our military did 20 years ago when Herman Kahn’s civil defense lectures were greeted with the comment that he had left out “morale” as a factor. His dry response was that he had done the calculation both ways, with and without morale, and gotten the same answer.

SOVIET POPULATION AND INDUSTRY DESTROYED (Without Evacuation)*

(Assumed 1972 Total Population of 247 million; Urban Population of 116 million).

1 MT Equiv. Delivered Warheads	Total Population Fatalities		Industrial Capacity Destroyed
	millions	percent	(percent)
100	37	15	59
200	52	21	72
400	74	30	76
800	96	39	77
1200	109	44	77
1600	116	47	77

*Fiscal 1970 posture statement.

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and now at the University of Miami. He paints a picture of single-minded, calculated and hard-headed civil defense preparations that seem, on reading the actual text, to be rather more the product of historical experience, and of entirely predictable bureaucratic efforts, to cope with problems wholly unsolvable.

Professor Goure is extremely well positioned for, and proficient in, parsing Soviet quotes to document his impressions of their plans and intentions. But sometimes one feels that his command of the literature is being misused. For example, in his foreword, he paints a fearsome picture backed up by a quote from a leading Soviet spokesman:

"In their discussion of arms control and disarmament, Soviet spokesmen have consistently rejected the concept of equal security based on a U.S.-Soviet deterrence balance of 'mutual assured destruction.' Indeed, as they candidly acknowledge, a major aim of Soviet strategy and buildup of military capabilities is to preclude the application of the American retaliatory assured destruction strategy, and thereby negate the effectiveness and credibility of the U.S. deterrence posture. At the same time, the Soviet Union has been constantly seeking to strengthen its own deterrence and war-fighting capability. According to the Soviet view, the credibility and effectiveness of the latter depends not only on the offensive capability of the Soviet strategic and conventional forces and especially on their ability to weaken the 'enemy's offensive missile forces' by means of a pre-emptive first strike, but equally on the capability of the Soviet Union to survive and recover from a nuclear war. 'No country,' the well-known Soviet spokesman G. Arbatov points out, 'can set itself the aim of defeating the enemy at the cost of its own destruction.'" (p. xiii)

Would you believe that, on page 39 of his own work, *Soviet Civil Defense*, Professor Goure himself quotes the very same Arbatov as saying that "nuclear war would be suicidal for both" U.S. and U.S.S.R.! This unusual bit of Soviet candor is not only at odds with the impression given by quoting Arbatov above but fully explains that quote as having quite the opposite meaning.

As for Professor Goure's assertion that the Russians "candidly acknowledge" that a major aim of their strategy is to preclude the U.S. retaliatory assured destruction strategy, why then did they sign the ABM Treaty? This certified a government-wide decision to acquiesce in mutual deterrence. (Professor Goure was surprised at their decision to sign this document and has no firm conviction

about their motives). And why did Brezhnev say, in July 1974, that accumulated nuclear weapons made possible "the destruction of all life on Earth several times" — a clear example of mutual deterrence rhetoric?

Finally, as for the doctrinal rejection of mutual assured destruction, this sounds ominous indeed until one investigates what the Russian spokesmen are saying. To quote from p. 36 of Goure's *War Survival in Soviet Strategy*, Soviet spokesmen reject the concept of security based on a balance of strategic deterrence because:

"... such a balance is inherently unstable because of constant improvements in weapons technology, the possibility of accidental escalation of a local war, or of political changes in the capitalist countries which might impel new leaders to risk nuclear war with the Soviet Union. In recent times, Soviet spokesmen refer to the discussions in the U.S. concerning the possibility of adopting a 'flexible option strategy' which may include a U.S. selective and limited first use of nuclear weapons in limited wars, or even against the Soviet Union in retaliation for Soviet aggression against third countries, and to the qualitative strategic arms competition, as proof of the instability of security based on 'mutual assured destruction.'"

In short, the Soviet position is a combination of recognizing that war can happen despite overwhelming deterrent capability (we would agree) and recognition that the United States is trying to devise strategies that will permit it to use nuclear weapons even in the face of these mutual deterrents.

America Has Sought Freedom to Use

Of the latter there can be no question. For example, on September 11, 1974, Secretary of Defense Schlesinger warned the Senate Foreign Relations Committee against the danger to Europe that would arise if America were seen as "self-deterred" by the consequences of a nuclear strike at the Soviet Union. He explained that this was the reason for his changing U.S. targeting doctrine to permit greater access to less than all-out strikes.

Indeed an objective observer would find at least as many (if not more) indications in the U.S. strategic literature of an intention to use nuclear weapons first, and to carry nuclear war to the other country, as it finds in the Soviet literature. The Soviet declarations normally do little more than assert that any nation attacking the Soviet Union will get a "crushing rebuff." But the U.S. strategic literature, for 30 years, has been primarily devoted to figuring out how to threaten to use nuclear weapons against the Soviet Union — despite whatever nuclear balance existed — in the event of a Soviet attack on Europe. Thus our literature, paradoxically, shows greater emphasis on "mutual deterrence" combined simultaneously with greater emphasis also on nuclear war-fighting. Public opinion (and common sense) has demanded the former while the NATO military "realities" have been viewed as demanding the latter.

But the parallels are really more striking than the differences. Just as Schlesinger worried that the United States might be deterred from taking action in a crisis, so Soviet military spokesmen try to find ways to assert that nuclear war is still an instrument of politics. And they do it also by expressing fear that the concept of mutual deterrence might make the Soviet Union vulnerable to U.S. "nuclear blackmail" — i.e., fearful of taking action in the face of

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American actions they considered hostile. This is the precise parallel to our NATO problem.

The Program Itself

The Soviet civil defense programs, as seen by Professor Gouré, is as follows in quotes and through paraphrase.

Soviet civil defense has been growing since 1951, especially since 1961, with a marked upsurge since 1972. The Soviet leadership has come to view civil defense as a critical strategic factor which can determine the course and outcome of a nuclear war. It is now spending over the \$1 billion a year it was estimated to be spending over the last two decades.

Measures Prescribed

Planning would disperse the essential workers, who would then commute to the plant in the city (40 to 60 miles), while non-essential workers would be evacuated to more distant rural locations and small towns where they would be settled for the duration.

In the late 1960's, the authorities decided that the provision of effective blast shelters for all urban residents was too expensive. But in 1974, this position was reversed and "present indications are that shelter construction in the cities and construction of fallout shelters in the rural areas have been stepped up." Gouré believes that:

"... there is no doubt that the cumulative construction of shelters since the mid-1950's has resulted in a shelter capacity for a large fraction of the population and that more are being added every year, especially under the stepped up shelter construction program introduced in 1974. The population is also being trained in the construction of hasty shelters, and according to Soviet plans, the entire population should be able to secure protection in either blast or fallout shelters within 72 hours of an announcement by the government that a 'threatening situation' exists."

Perfection of the Economy

According to official Soviet sources, since 1966 at least 60 percent of all new industrial plants have been located in small towns. This program was termed, by Colonel-General Altunin, a "decisive measure for ensuring the viability of the economy in wartime."

The Soviet civil defense program requires industrial plants to harden their facilities. There are "clear indications" that the hardening process is very much in process of being carried out, although because of the considerable capital construction requirements, its completion will require a number of years.

Stockpiling

The Soviet Union has on the order of one year's war reserve of grain, a considerable amount of food reserves in the cities, and much of total annual grain production kept at the farm, so that there would be sufficient food there to feed urban evacuees.

Gouré's Appraisal

The implementation of the program is uneven. Soviet authorities complain of public apathy, of oversimplified training, of neglect of industrial hardening measures, of problems in preventing the growth of large cities, of poorly trained civil defense units. No large-scale evacuation exercises have been held for entire cities.

It is "evident" that with a few days' warning, the authorities could evacuate the great majority of urban residents and provide them, as well as the rural population with protection against fallout. The knowl-

SOVIET URBAN POPULATION

Cities	Numbers of	Population	Percentage
Numbers of Residents	Cities	Total (millions)	of total
500,000 and over	35	41.7	27.9
100,000-500,000	203	43.7	29.2
20,000-50,000	618	191.0	12.7
10,000-20,000	973	13.6	9.2
5,000-10,000	1,502	10.6	7.1
3,000-5,000	1,040	4.1	2.7
less than 3,000	1,115	2.1	1.4
Total	5,699	149.6	100.0

edge of what to do in an emergency has become "well ingrained" in the majority of the population despite indications of popular skepticism.

An Assessment of the Assessment

The rates of spending on civil defense in the Soviet Union should be assessed by the rate of spending in other countries ravaged by European-type wars. The \$4 a year per capita estimate for Soviet Union is, its sources admit, only a guess. But would it be inappropriate in any case? The Swedes spend \$4.02, the West Germans about \$4.10 and the Swiss spend \$50.00 per person annually!

Whether there was an upsurge in Soviet civil defense in 1972 is hard to establish but would be easy to explain. What could be more natural than for the Soviet Defense Ministry to increase its allocation to civil defense in the wake of a Politburo decision to agree, in that same year, to a prohibition on anti-ballistic missile systems?

The notion of dispersing essential workers and evacuating nonessential workers to rural locations is much less workable when one examines the above table. Rural locations must really mean rural to be out of the reach of the thousands of warheads. Is it really feasible to move more than a hundred million persons into rural areas and resettle them there for the duration? This is much like turning the society inside out.

It seems indicative of the difficulties this would pose that the authorities seem to have reversed themselves, as Gouré notes, and to have ordered the construction of blast shelters in cities. But even civil defense enthusiasts, such as T. K. Jones, argue that blast shelters in cities would not be very effective.

The post-1966 dispersion of new industrial plants to small towns, often referred to, also underestimates the fact that even small towns are vulnerable to the retaliatory capability of a U.S. MIRVed force that can cover so many targets. As for food reserves, the one-year war reserve spoken of is not much insurance even if it exists. Food stockpiles may be attacked and destroyed — a significant number have been identified and no Soviet authorities can assume they would not be attacked. Furthermore, the very ability to grow food in a post-war world is unclear. There is the radioactivity in the soil which may preclude or complicate the growing, or the eating, of foodstuffs. There is the possibility that the war would so disrupt the ozone layer as to make prolonged exposure of the outdoors impossible for the farmer.

There are also other weapons effects not fully understood when detonations involving so many megatons are involved. For example, the possibility of a shift in the climate, due to particulates thrown into the atmosphere or some other weapons-related cause has to be considered.

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The Second Optimism: Industrial Recovery

But it is not enough to be optimistic about population survival. Since the cities are conceded to be destroyed, one must be optimistic also about industrial recovery. Such extraordinary optimism is to be found in the report of a leading civil defense enthusiast, T. K. Jones. But it is hard to credit.

Industrial Recovery After Nuclear War as Seen by T. K. Jones

The conclusions of T. K. Jones are summarized in the graph on this page. It reflects the view that industrial recovery is basically dependent upon population survival and that recovery is an exceedingly rapid process.* For example, this graph suggests that a country could lose 50% of its work force (which means, in many cases, half its population) and all of its industrial capital and recover in 15 years! The recovery should be to prewar GNP level! (In particular, one reaches the absurd conclusion that GNP per capita would be about twice what it is now.)

If all the population survived, even if all the industrial capital value were destroyed, this graph suggests that the prewar GNP would be achieved in 5-7 years! The report suggests that this graph is the collective conclusion of a number of U.S. studies on recovery but does not reference them.

The second conclusion of this testimony is that it is relatively easy to avoid the destruction of the industrial capital value, so long as one is willing to close it down. The last caveat is very important since implementing protective structures for operating plants is considered enormously expensive. However, if the equipment were to be packed in sandbags, or earth, Jones argued that blast protection of up to 80 psi might be achieved. For further protection, equipment would have to be completely surrounded with foamed plastic or metal chips from machining operations. In some cases, machines would have to be coated with grease and flooded in water, and so on. It was believed that, for \$200-\$300 million, preparations could be made to provide 40-80 psi protection and, for ten times that amount, 200-300 psi protection.

The third conclusion of this study is that the Soviet Union is well positioned to take advantage of the first two conclusions. It would disperse the population over a wide area, pack down industrial machinery and execute an attack.

The testimony shows, however, that there is little difference in casualties between an unevacuated population attacked in cities and an evacuated population attacked by missiles that are ground burst so as to produce fallout. In short, seeing the evacuation taking place, U.S. planners might target weapons so as to attempt to create fallout.

Of course, if one assumes that the evacuated population can build effective fallout shelters and stay in them, then immediate fatalities can be reduced, according to this report, to about 10 million. But these shelters are assumed to provide a protection factor of 200 psi which, while described as "simple" in the testimony, is not so simple as all that. It would be necessary to stay in the shelters not only hours but a few days. The discipline required to do this would be extraordinary, since the shelters discussed in

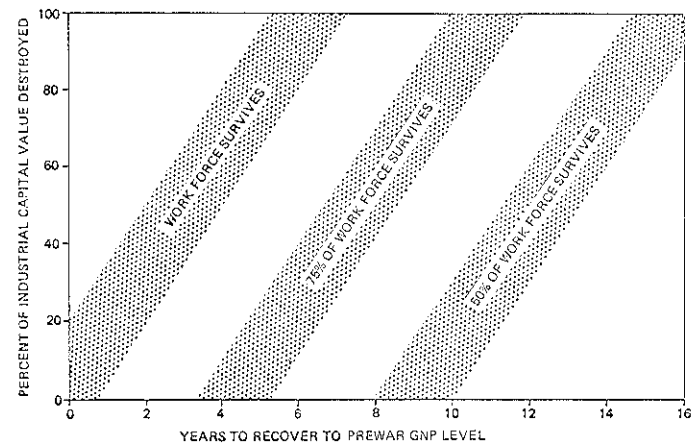


Figure 1. Postwar Recovery (1985 Time Period)

Soviet texts hardly provide room to move, with persons taking turns lying down, and so on. (The human problems associated with this need not be dilated upon). And the fallout provides all the recovery uncertainties mentioned above.

A COUNCIL MEMBER DISSENTS

"The editorial asks some very relevant questions about the credibility of the threat raised by a USSR civil defense posture based on evacuation. These are matters that deserve careful and serious debate. However, I cannot agree with what seems to me to be the underlying implicit assumption in the editorial—that an offensive stand-off such as we now have is stable, whereas a defensive stand-off, which would exist had the great powers opted for ABM and civil defense, is destabilizing. I have never been convinced of this, although I realize this is the basis of our whole deterrent policy. To my mind a defensive confrontation would be better than an offensive confrontation. My main reason for so believing is that I don't see how suspicious antagonists can permit real disarmament, and thus weaken the offensive deterrent, unless they can count on some safety through defensive systems—in short, civil defense may be a prerequisite for real disarmament.

I believe a dispassionate re-examination of the arguments for and against civil defense, in the present context, are called for. The editorial in imputing to those who favor civil defense Strangelovian instincts makes this re-examination more difficult. I therefore wish to register my dissent." Alvin Weinberg

Editorial Note: Is it true that a "defensive stand-off . . . would" have existed if the great powers had opted for ABM and civil defense? Or would they have simply bought further offensive weapons: MIRV to overwhelm the defenses (as they have) and cruise missiles (as they are about to) which would circumvent the defenses, and so on? And if, in the long run, disarmament eventually reached the point where deterrents were not adequate, would adversaries—if still "suspicious"—rely upon civil defense, which only mitigates damage, to prevent war?

In any case, does the editorial really implicitly presume that mutual deterrence is "stable" or does it only decry current exaggerations of the instability that civil defense can produce? In any case, above all, does it consider alarmist those who favor civil defense or those who want Soviet civil defense further neutralized?

*Industrial Survival and Recovery After Nuclear Attack; November 17, 1976 report to Joint Committee on Defense Production; prepared by Boeing Aerospace Company.

COMMENTS ON THE DECEMBER ISSUE ON SCIENTIFIC RESPONSIBILITY

The December Report questioned the ability of professional scientific organizations to monitor and maintain the standards of behavior of scientists participating in the public debate over science and public policy issues. It argued that these scientists were necessarily involved in media conditions, time pressures, factual uncertainties, and tactical political choices entirely foreign to traditional science. To the extent to which a free marketplace of ideas failed to keep the discussion honest, it urged public interest scientists to evolve (and help to) appropriate standards. Members were encouraged to comment.

One Council Member, Alvin M. Weinberg, congratulated FAS on bringing the issue of scientific responsibility to a focus and on encouraging debate on it, but registered a dissent, observing that he had been out of the country when the Council's opinions were canvassed. He wrote:

"The editorial sets up two scientific worlds: the world of conventional science, and the world of public interest science. The implication is that these worlds are to be governed by two different standards of proof — a higher standard for the first world, a lesser standard for the second world. 'Public interest scientists should have the right to be judged by their peers — by others who have run the societal gauntlets involved. Through their own peer-group pressures — and their public service awards — scientists involved in public debate will provide role models for each other.'

"I cannot accept such a dichotomy. A scientist, if he claims expertise as a scientist, must adopt the same norms of scientific conduct when he speaks in the public, and on behalf of what he perceives as the public interest as when he speaks in the scientific community. To do less simply disqualifies him to speak as a scientist, either public interest or conventional.

"I recognize that such a rule of conduct can be over-interpreted, and in fact seems to be in the editorial '... the narrow view implicitly discourages involvement by scientists in public debate...' I do not wish to discourage public debate by scientists who are so inclined. By no means; I simply ask that when they speak as scientists they exercise the same care and effort that they exercise in scientific discourse. The essence of scientific responsibility is the inner drive, the inner necessity to get to the bottom of things; to be discontent until one has done so; to express one's reservations fully and honestly; and to be prepared to change one's views if better evidence shows them to be erroneous.

"Thus it is irresponsible for a scientist who believes he has evidence showing that standards for certain environmental insults are too high to announce his findings in a public forum before he has submitted them to a refereed scientific journal. The retort can be made that the refereed journals are in the hands of the establishment, and that doctrines that fly in the face of conventional wisdom have no chance of being published. If indeed the findings are rejected by the establishment, and the scientist finds no merit in the reason given for rejection, he can and should still go to the public; but only if he is prepared to say to the public 'I, as a scientist, believe what I say. However, these findings are not held by others in the field.'

"Is this hopelessly naive or unwieldy? It may be naive and unwieldy, but I believe something like this

is necessary. Unless public interest scientists accept implicitly or explicitly some such norm of behavior, of self-policing, their usefulness to the public will diminish. The public will tire of those who consistently overstate things to make their point, who use not science but a perverted sort of ex-cathedraism to prove their point, who brook no counter views, and persistently represent as given and known what is not really given and known. The ultimate result of such conduct will be a serious loss to conventional science, to public interest science, and most important, to the public.

"I cannot but contrast the present situation when so many scientists speak as *scientists* on matters on which they can claim little expertise with the situation some 30 years ago when F.A.S. was founded. At that time the issues raised in the editorial were largely non-existent. All of us knew what the scientific situation concerning the bomb was; in particular, that there was no such thing as a 'secret' of the bomb. Our responsibility, simple and clear, was to impart that knowledge to the public, and to arouse the public to do something about it. We had no desire to speak much beyond what we as scientists were confident of.

"I realize that today's world is ever so much more complicated than was the world of 1946, that there are many issues today far more complex than those we confronted in 1945. Nevertheless, I should think the founders of FAS, who by and large stayed close to the science they truly understand, are more appropriate role models for today's public interest scientists than are some of the noisier, but in my view scientifically less responsible, participants in today's debate."

Editorial Note: Is this really a dissent? The environmental example he provided shows a distinguished public interest scientist, Dr. Weinberg, evolving a plausible new standard (viz., try to publish first) for dilemmas totally unfamiliar to traditional science (viz., when to speak out) and then urging that his public interest peers accept "implicitly or explicitly some such norm of behavior." Thus he seems to be illustrating precisely the activity the editorial called both necessary and desirable: peer group pressures by public interest scientists to evolve standards to resolve those novel dilemmas posed by conflicts between responsibility to science on the one hand and to citizenry on the other.

Professor John Lamperti of Dartmouth wrote: "I find the [editorial] in general to be quite good, and can unhesitatingly choose the second version of 'responsibility' as the right one for me and certainly for the FAS. I should say that the first definition ceased to be viable with the many highly important applications of advanced technology to warfare during WW II." He enclosed a preface of a new book encouraging scientists to organize and to get together "in old and new ways" to put their ideas into practice.

Dr. Eli Robins of Washington University wrote: "... responsibility is primarily a scientific one. It is only secondarily a responsibility to the public except in times of extraordinary crises."

Professor Duncan MacRae, Jr., of the University of North Carolina, wrote: "The question of responsibility — what it is, to whom it is due — cannot be answered, in my

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judgement, without our first formulating a systematic ethic involving some notion of the general welfare or the public interest." A number of relevant reprints were enclosed in which Professor MacRae had developed his idea.

Nobel Laureate Robert S. Mulliken congratulated FAS on the Report, agreed with the editorial, and provided some judicious solutions to the dilemmas outlined.

Dr. Karl A. Hartman, Jr., of Kingston, Rhode Island, commented scathingly on the state of scientific responsibility within traditional science and concluded: "Scientists should be responsible to truth and to the people of America."

Mr. Ronald A. May, past chairman of the American Bar Association Section on Science and Technology wrote, in the one antagonistic comment: "The approved statement (i.e. the editorial) was harmless enough although monumentally banal. The rest of the Public Interest Report was offensive." □

NOMINATIONS FOR COUNCIL

The Chairman's two-year term expires in June, 1978, and the Vice-Chairman's term, while expiring in June, 1977, is once renewable under the by-laws. As a result, there will be no election for Chairman in April and the Vice Chairman has been proposed by the nominations committee to run for a second two-year term unopposed.

As for the Council, the Nominations Committee proposed, as required by the Constitution, the following nine nominees for the six openings on the Council occurring in June: James Arnold, chemist, University of California at La Jolla; Bruce Ames, biochemist, University of California at Berkeley; Nina Byers, physicist, UCLA; Thomas Eisner, biologist, Cornell; Anthony Ralston, computer scientist, University of New York at Buffalo; Arthur Rosenfeld, physicist, University of California, Berkeley; Carl Sagan, astronomer, Cornell; Sidney G. Winter, Jr., economist, Yale University.

Members wishing to nominate by petition one or more candidates for the Council should secure supporting signatures by ten or more members. (With regard to the question of participation by women, the Nominating Committee reports that the percentage of women serving on the Council continues to exceed the percentage of women in science and in FAS).

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DOES NSA PREFER CODES IT CAN BREAK?

Charges are being circulated that the National Security Agency (NSA) is encouraging the National Bureau of Standards to adopt a Data Encryption Standard for encoding commercial data that will permit it to break the code involved. The most plausible reason for NSA to engage in such action stems from the likelihood that the hardware approved for encrypting the data will spread around the world and become standard.

It all began when the Bureau of Standards took responsibility for adopting a compatible standard and process by which government agencies could provide each other with data that was secure against surveillance. This was a step forward in maintaining security for such data. Opponents are asking whether the Bureau went far enough.

The sender and the receiver of information must, under the system proposed, share a "key" to the code which is basically 56 bits of information (in effect, a 56-length sequence of zeros and ones). It is believed that breaking the code would require exhaustively searching all possible keys, of which there are 2^{56} , or 10^{17} . Could anyone do it?

Martin E. Hellman of Stanford University says that it could be done now, or soon, for \$20 million. IBM says it could be done for \$200 million by 1981 and the machine would break the code in a day. Three members of Bell Laboratories (Robert Morris, N. J. A. Sloane and A. D. Wyner) agree that there is "little safety" in a 56-bit key and urge moving to 128. And Hellman thinks that close study of the IBM design, which the Bureau adopted, might permit a decoding approach much quicker than exhaustively searching all possibilities. He says IBM has been ordered not to release any information about its design principles by NSA.

In the *New York Times*, David Kahn, author of "The Codebreakers," speculated that NSA wants a standard high enough to prevent commercial decoding but not so high that NSA could not break into the increasingly large flows of financial information flowing into America from abroad.

FAS's concern is not so much NSA surveillance but that of other large industrialized nation states. What NASA can crack, Japanese or Soviet cryptographers presumably can also, in due course. Will our desire to deny privacy to others abroad lead, eventually, to a loss of privacy at home? This would be a familiar pattern, if so. □

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