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Nuclear Weapons and the Future of Man

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NUCLEAR WEAPONS AND THE FUTURE OF MAN

One of history's recurrent tides for peace may again be flowing in the world today. In the United States, among our allies and possibly even in the Communist bloc there is a deep realization that a nuclear world war would mean only mutual destruction and there would be no victor. Advances of fantastic proportions have been made in the nuclear and thermonuclear sciences in the past ten years. If utilized to the detriment of man, they could very easily erase these achievements and those of past centuries in a matter of days. We have harnessed a new energy, the atom, that can destroy cities and complete armies, against which there is little defense. Yet, if used properly, this new energy can be utilized for the benefit of mankind in industry, transportation and power.

Almost a year ago I began to take particular note of these new problems and dangers confronting us with the advent of the atomic and hydrogen bombs. In April I compiled my views and thoughts in a speech to the Senate. My entire source of information at that time as it is today was from newspapers, magazines, quarterlies and public documents. The results of my first efforts to analyze the situation evolved around a chronology of events occurring since the first atomic bombs were dropped on Nagasaki and Hiroshima in Japan at the end of World War II.
Today I wish to expand on the more recent developments, the program for the future and some of the serious problems facing the policy makers of the world. There are three general areas which I wish to discuss:

1. Radioactive fallout.

2. The position of atomic and hydrogen weapons in our military program and defense system.

3. An effective program to preserve peace and to combat the threat of world-wide devastation in nuclear warfare.

Radioactive fallout is a shower of dust after a thermonuclear explosion. The mushrooming cloud in an atomic or hydrogen explosion is made up of dust particles which are spread by the winds after an explosion. They settle down over wide areas with the winds or they are carried down in rain or snow.

It was this dust that fell on the Japanese fishing boat that was contaminated by fallout 100 miles from the Bikini hydrogen explosion March 1, 1954.

According to reports the fallout peril depends upon how much radioactive dust is created in the moments following the explosion. In an air burst, dangerous fallout dust is made up of fragments of the casing of the bomb and its vaporized mechanical components plus the end products of the fission and fusion reactions. A wide range of chemical elements is involved, a field in which I am strictly an amateur.

Also, according to correspondence with scientists and newspaper sources, some stray dust particles floating in the air may become irradiated.
to a high degree. But the total amount of air burst dust is relatively small.
The fallout hazard, as I understand it, is much greater with an explosion near
or at the surface. Tons of earth and rock and other terrestrial objects
destroyed by the explosion are sucked up into the great mushroom. Intense
radiation transforms these particles into hot radiation emitters. The great
force of the explosion blows the radioactive dust very high. The heavier
particles may fall soon, while the light particles may stay in space for a
long period of time. The radioactive "hot" particles which fall in a matter of
hours after the explosion are the deadly menace.

The perplexing problem is what effect do these experimental explosions have on the human race, today and in the future. It is
generally recognized that the immediate fallout of radioactivity after a test
explosion in the immediate area is dangerous and deadly. Inadequate answers
remain to the problem of the long-range possibility of increasing the natural
background radiation of the world as a whole. Another question unanswered is
how much effect does the fallout have internally on human beings? There have
been opinions of one extreme to the other coming from scientists and public
figures. Only recently has there been any official pronouncements coming
from the Atomic Energy Commission.

Late in May, this year, a Yale physicist charged the AEC with
giving what he called misleading information about the danger to mankind
from atomic test blasts. He warned that the radioactive fallout from such
blasts is producing genetic effects in mankind that will be showing up for
"thousands of years to come." The expression of these fears has diminished somewhat in recent weeks.

Professor Milton S. Livingston of the Massachusetts Institute of Technology, also chairman of the Federation of American Scientists, says that those people who say H-bomb tests are a danger to mankind and that they must be stopped are making these statements on an uninformed basis and that time will have to pull the picture into perspective.

Eminent scientists such as Dr. Ralph Lapp and Dr. H. J. Muller show concern about the long-lasting effect these experimental tests may have upon the human race in the future. However, they feel that we cannot jump to conclusions and it is important to have more complete information from authoritative sources.

Dr. Willard F. Libby, Commissioner of the AEC, speaking at the Alumni Reunion at the University of Chicago, on June 3, 1955, said that:

"Tests, therefore, do not constitute any real hazard to the immediate health." Incorporated in his speech was a statement on the genetic question prepared by the Advisory Committee for Biology and Medicine to the AEC. The last two paragraphs of this report read as follows:

"No measurable increase in defective individuals will be observable at any time as the result of current weapons' tests, since the few radiation-induced defectives will not change measurably the number of about 40,000 defectives who will occur spontaneously among the four million births of each year in the U.S. It may be pointed out that no significant change in the percentage of malformed children has been observed among those conceived after the war whose parents had been exposed to the atomic bombs in Hiroshima and Nagasaki."
"The foregoing conclusions apply only to the genetic effects of weapons' tests carried out at the present level and of foreseeable peacetime uses of atomic energy. The genetic effects of a generalized nuclear war would be one of many catastrophic consequences of such a disaster."

More intensive studies are needed and more information must be made available before any sound conclusion can be reached on the question of radioactive fallout.

In my April speech I expressed my concern about the theoretical Cobalt bomb, its vast destructive power and its threat to all mankind. The C-bomb has never been tested. My concern over this mythical bomb has been minimized by the now numerous reports of the superbomb or U-bomb. This new weapon was detonated in the March 1954 test on Bikini. This was no A-bomb such as was dropped on Hiroshima and Nagasaki in 1945; nor was it an H-bomb such as was tested at Eniwetok atoll in 1952. It was a U-bomb triggered by fissionable uranium 235, fanned up by a fusionable hydrogen ingredient and finally split asunder by enormous fissioning of ordinary uranium 238. This has been verified by the recent report made by Dr. Libby of the AEC.

I believe that ordinary atomic bombs are measured by "kilotons" and thermonuclear weapons are measured by "megatons." A kiloton is equivalent to 1,000 tons of TNT; a megaton to 1,000,000 tons. It has been estimated that the Bikini explosion equalled 14 to 16 megatons.

According to Dr. Libby's recent report, the energy is released by fission rather than fusion. This indicated that ordinary, cheap uranium 238 was the major explosive content and was responsible for fallout over a vast area.
One of the most significant things about this newly released information on the H-bomb is that it means that Russia or any other nation capable of making atomic bombs can, with a little more effort, create super-bombs.

This cheaper weapon is tremendously more deadly than a pure hydrogen bomb. The destructiveness of a hydrogen bomb is produced by heat and blast. By adding ordinary uranium to this weapon, the additional lethal radioactivity is created. Dr. Libby's report has confirmed, at long last, the speculations and deductions of eminent scientists like Dr. J. Rotblat, British physicist and Dr. Lapp, as well as many others.

There are several conclusions that can be drawn from the information made available to the general public. The U-bomb is cheap. The weapon can be made in any size because of its comparative simplicity and the cheapness of Uranium 238. The only restriction on the size of the bomb is the method of delivery. One of the results is that the fallout persists for days, weeks or months. In addition to its direct or external radiation effects, the weapon creates toxic products like Strontium 90 and radioactive iodine in large quantities, which are internally damaging.

The information finally coming out is material which is vital in our civil defense set-up. It has been almost 15 months since the super-bomb was detonated. But for the fallout that sickened the Japanese crew 100 miles from the explosion site, the non-official scientific world might not have learned that the United States had achieved a vastly more powerful weapon.
Until Libby's talk to the Chicago alumni, AEC's comments on fallout had been pretty well limited to the much-publicized news release by AEC Chairman Lewis L. Strauss last February 15, 1955. In it, he officially conceded the existence of fallout and described the pattern it took at the Bikini test. Admiral Strauss did not discuss "persistence" -- how long and to what extent fallout radioactivity can deny humanity a normal above-ground existence. This is the information which is necessary to have made known in order to prepare any type of defense.

Dr. Libby has now testified that fallout radioactivity becomes one-tenth as intense seven hours after the burst, one-hundredth after the first two days, one-thousandth after the first two weeks, and one ten-thousandth after the first three months.

The AEC has been very reluctant in releasing official facts about atomic and hydrogen bomb tests, the after-effects, persistence of fallout or any recommendations for protection against the heat, blast and radioactive fallout, products of these thermonuclear blasts. The first official facts about the March 1, 1954 blast were released by the AEC on February 15 of this year, almost a year later. In fact the AEC denied the existence of the new super-bomb until the recent Libby report. I fear that the Administration has failed to take the public into its confidence. We must face up to the facts and adequate information must be available if we are to carry out any realistic program of defense.

The people must have all the facts possible so that they can understand the nature of the problems which confront them. We in America
do not need a glossy coating on unpleasant material. If we are supplied with the necessary information, there will be no panic or hysteria. I think perhaps some of the lack of interest in our civil defense program is due to the fact that people do not realize what we are faced with in thermonuclear weapons.

I wish to voice my unqualified support for the United States proposal that the United Nations evaluate the effects of nuclear radiation and fallout from atomic and hydrogen bomb tests. I spoke of such a plan in my previous speech. The proposal was originally suggested on March 6, 1955 by the Federation of American Scientists, a group of 2,200 United States scientists and engineers concerned with science's role in world affairs.

This proposal is a major step forward. An assemblage of radiological information from all sources will make it much easier to answer the questions raised throughout the world about the possible harmful effects of nuclear tests.

This U.S. proposal was announced by Ambassador Henry Cabot Lodge, Jr. at the United Nations commemorative session at San Francisco. This proposed study is essential to insure that humanity is not endangered by these tests. A general study of this nature has already been undertaken by the Federation with a grant from the Rockefeller Foundation.

At this point I think it appropriate that I speak briefly about several problems involving our scientists -- namely, security and the shortage of capable scientists and engineers.
In the May 27 issue of Science, a bulletin of the American Association for the Advancement of Science, Dr. M. Stanley Livingston said great difficulty had been met in finding scientists willing to talk in public about the problem of nuclear radiation hazards.

"This experience illustrates," Dr. Livingston reported, "one of the political dilemmas in which we find ourselves.... Those who know won't speak and those who don't know cannot speak with authority." Security regulations, fear of controversial issues and administrative restriction on speaking by employees were cited by Dr. Livingston as the reasons that a scientific-political program was difficult to arrange.

It is unfortunate that in this nation of ours that men who attempt to voice an opinion run the risk of being accused of having communist leanings or lacks professional competence. We are fortunate that there are a few who are willing to take the risk and express their particular viewpoint. Without these few we would be lost because solutions can be arrived at only after proper discussion.

Insecurity in the field of science has a definite bearing on the appeal and inducements to bring new and fresh talent into the science and engineering fields.

In an address before the Alumni Federation of Columbia University, Allen Dulles, director of the Central Intelligence Agency, said that in the decade from 1950 to 1960, the Soviet Union would graduate 1,200,000 scientists and engineers, compared to 900,000 in the United States. He warned that
unless something was done at once, Soviet scientific manpower might well outnumber ours in many key areas.

In an article in the May 31, 1955 issue of the Washington Evening Star, Ben. H. Bagdikian brought forth some very enlightening figures. This article cites a 1953 poll of science Ph.D. 's graduating from research universities which showed them equally divided where they would like to work, one-third each in Government, industry and universities. In 1954 -- after the investigation of Fort Monmouth and the case of Dr. J. Robert Oppenheimer -- a poll of Ph.D. 's showed that the 33 percent who wanted to work for the Government had dropped to 8 percent. The chief reason given: security.

The nation cannot afford to discourage young scientists. At a time when its requirements for trained men are rising sharply, bachelor degrees in science have been dropping, 20 percent in 1950-51, another 25 percent in the next year. In four years all bachelor degrees in science and engineering have dropped from 80,000 to 34,000. We cannot underestimate the quality of Russian scientists and engineers. If this trend is not diverted we will be threatened with the loss of the battle for scientific manpower. In addition the Federal government cannot afford to encourage public contempt of highly trained and skilled men in the sciences.

I plan to discuss this matter of scientist and engineer shortages more completely at a later date. Briefly, there are a number of things which can be done to give new life to the incentives in the science fields. Encourage the study of science at the high school level; better teaching
methods and facilities; a correction of the selective service laws; a Federal scholarship program to help worthy students meet expenses; and finally a better public relations and security program.

Theoretically, the entire human race can for all practical purposes be eliminated for the small sum of about 40 cents per human, give or take a few cents either way. The authority for this statement is credited to Dr. Leo Szilard, a distinguished physicist, by columnist Stewart Alsop. This statement is somewhat misleading since it makes no allowance for the cost of delivery or the attrition of defense. It assumes in effect, a deliberate, unopposed effort to commit global suicide, for which I presume the human race is not yet ready.

However accurate this statement by Dr. Szilard may be, it makes it very plain that this enormous scientific advance opens up the possibility of genuinely unlimited destruction at very low cost. Combined with the fallout phenomenon it basically transforms the whole world situation.

The second question which faces our policy makers who must deal with these new advancements in science and warfare is -- what part do the atomic, hydrogen, and super-weapons play in our overall military and defense program?

At the height of the debate over our foreign policy in the Formosa Straits, Secretary of State Dulles put forth a new policy, endorsed by President Eisenhower -- the doctrine of "limited" atomic war with tactical weapons. This approach seemed plausible at first glance, but further examination brings a considerable number of doubts to mind.
In 1949 this doctrine may have been a great deterrent to war, because of our great superiority in the development of nuclear and thermonuclear weapons. We no longer have this great advantage. The Soviet Union has advanced much faster than predicted. We do not know whether they have the U-bomb, but we do know that they have tested the H-bomb. It is likely that they will have the super-bomb in the near future if they do not have it already, because of the general simplicity in development of this new force, once you have mastered the atomic bomb, which they have done.

Tactical weapons used on military targets only, is a wishful attempt at minimizing the dangers of nuclear warfare. Can we rely entirely on this increased precision and accuracy? These nuclear weapons, large and small, are subject to error, human and mechanical. Weather conditions can change at the last moment. Military installations are usually near towns and cities. A weapon large enough to insure the destruction of such a military target will almost inevitably take a toll of non-military areas. To paralyze an enemy it would be necessary to hit the centers of industry, which are heavily populated.

We may use a small atom bomb on an aggressor, but we can expect retaliation. The enemy may not have perfected a tactical atomic or hydrogen weapon, so they will drop several large ones. The next step would be a thermonuclear holocaust out of which would emerge no victor.

I find little assurance in the possibility of limiting an atomic war once it was started.
We have geared our national defense policy to nuclear weapons to such an extent that we are not really prepared to fight a non-nuclear war. We are cutting the budgets of our armed services and reductions are planned in manpower. The consequences of a cut-rate defense policy can be disastrous. I am pleased with and wholeheartedly endorse the increase in the Defense Department's funds, being granted for fiscal year, 1956. At this point I wish to take the opportunity to commend my colleagues here in the Senate who have taken it upon themselves to warn the people against the complacency about our air superiority over the Soviet Union. Extended debate and testimony indicate that we are not necessarily in the lead in every respect in air superiority. Our advantage today is in means of delivery, but Stewart Alsop reported on May 16, 1955 that the Russian Type 39 and Type 37 do the same jobs as our B-47s and B-52s with half the number of engines. This means that the Soviet engineers have developed jet engines with twice the thrust of any yet achieved in this country. All indications are that we are neck and neck in the race to develop the intercontinental missile. Perhaps our biggest asset is our industrial capability and an advantage in offense and defense due to our air bases around the world.

A revulsion to the use of nuclear weapons is developing throughout the world. It is not very different to that which eventually was followed by the banning of poison gas and bacteriological weapons after the first world war. When that revulsion is added to the prospect of mutual annihilation, it may be that atomic weapons may also be headed for outlawing. If that should be the
case, we are playing into the hands of the Russians by relying almost exclusively on nuclear weapons in our plans for massive warfare.

Recently Brig. General Thomas R. Phillips, military analyst of the St. Louis Post-Dispatch, called for the abolition of nuclear weapons and proposed in effect that the NATO countries, which have 160,000,000 more people than the Communist bloc, match the armed strength of the Russian and satellite forces.

Phillips said that "a nuclear war is so destructive that no one could possibly win." He continued: "Such a war has no relation to any war that ever has been fought before. It is necessary to prevent it before mankind destroys itself. A single thermonuclear bomb today can release more explosive energy than has been used in all wars since gunpowder was invented."

The greatest problem that we face in the future is setting up a world-wide program for the advancement of peace and an operative disarmament program. It seems much more difficult, however, to chart a positive and constructive future than the negative one that we have been following, up to this time.

As Albert Einstein once said, "Every step appears as the unavoidable consequence of the preceding one. In the end there beckons more and more clearly general annihilation."

Man has developed the means to destroy himself. A satisfactory nuclear disarmament agreement may take years to reach. Our first objective should be to get on at once with the discussions which may lead to an agreement.
In considering the possibilities of an arms control program there are several things which must be considered. Huge bomb stockpiles in themselves are no longer of any great advantage because of the unlimited destructive power of these super-bombs. As Dr. Libby said in his report, 30 ten-megaton U-bombs could blanket the entire continental United States with radioactive fallout and, of course, cause enormous blast, burn, and localized radiation in the immediate areas hit.

The value of numerical superiority in nuclear weapons has declined considerably. The American lead in the stockpile of atomic and hydrogen weapons is of less significance today. If the enemy has enough bombs to destroy us, there is little advantage in our having enough to destroy him three or four times over. Scientists moreover now believe we are approaching the ultimate weapon in the IBM -- the intercontinental ballistic missile -- which will soar through the stratosphere to bring death and destruction from blast, radiation, fire, and fallout. The earth is of a limited size and the IBM is believed to be virtually unlimited in distance and destructive powers.

International inspection, as first proposed in the Acheson-Lilienthal-Baruch plan, no longer provides fool-proof knowledge of a nation's nuclear buildup. With natural uranium as the basic ingredient, only a minimum amount of the costly uranium 235 and plutonium need be produced and could be easily hidden. There will be no need for many huge power sources, no need for enormous gaseous diffusion plants, such as that at Oak Ridge, Tennessee.
As so pointedly stated by Washington Post & Times Herald columnist, Chalmers Roberts, leaders on both sides of the iron curtain are beginning to alter their thinking and policies because of the nuclear facts of life.

It has become quite obvious that absolute control of all fissionable material - including each and every weapon - is now impossible. It is impossible because it has become relatively easy for any nation which has mastered the original technique to manufacture fissionable material and to create A and H bombs.

There have been a number of proposed disarmament programs. It is generally agreed that in this day and age, a relative, rather than an absolute program of controls over all types of arms and armed forces might be obtainable. A pre-requisite to any effective arms control would have to be a relaxation of world tension. There is some indication that there may be a general relaxation of tensions at the present time. That possibility will be put to a test at the forthcoming summit meeting of the Big Four.

Any effective arms control plan may also require a ban on nuclear tests. There are arguments, pro and con in this respect. Continued tests of nuclear weapons are probably of less value to the United States than they were several years ago, prior to the testing of the H-bomb. Now our scientists and defense officials are primarily interested in greater weapon efficiency. Continued tests would be more useful to nations who have not progressed as far in nuclear weapons as America. Tests would be necessary for all countries
which are attempting to develop the intercontinental ballistic missile. As I have said, the IBM is believed to be the ultimate in weapons and it is the goal which the United States must reach first, unless an effective arms control can be perfected.

A ban on tests would introduce an element of uncertainty into the development of guided missiles. The scientists could not be sure that the missile would perform as calculated. Concealment of tests might be possible in deep mines, though it would limit their usefulness. I seriously doubt that anyone could conceal an H-bomb explosion.

One of the greatest problems in any arms control program would be the question of how to make use of atomic energy for peaceful purposes and at the same time eliminate bomb-making potentialities.

In addition it is necessary that reductions in conventional weapons proceed along with nuclear disarmament. If arms control were limited to nuclear weapons, the Soviet would hold a decisive advantage with its massive ground forces and new advancement in air power.

Our country has been the target of much harmful propaganda abroad, due to the shift in winds at the March 1, 1954 H-bomb test at Bikini and the accidental injury to Japanese fishermen and some of the Marshall Islanders. It is clear that we will suffer further harmful propaganda if we continue tests without having the approval of friendly and neutral nations. As long as we must compete with the Soviet Union in the race for superiority in thermonuclear weapons we must continue to test these weapons.
Therefore, I wish to emphasize again that a United Nations study which would confirm the AEC assurances that well-safeguarded tests in small numbers would not exceed the danger threshold, would do much to quiet fears among our allies and friends.

Ambassador Lodge could not have chosen a better way to relieve fears about radioactive fallout than to propose a survey through the United Nations. I sincerely hope that the Administration will press for support of the Ambassador’s proposal before the United Nations in September.

In the meantime it would be most appropriate for the Senate Foreign Relations Committee to begin consideration of Senate Concurrent Resolution 22, a resolution favoring United States participation in a scientific commission within the United Nations to study certain effects of nuclear explosions. This resolution was introduced by the distinguished Senator from Maine, Mr. Payne. I am proud to be one of the co-sponsors. Before adjournment, I feel that it would be a big help if the Senate went on record overwhelmingly in favor of Senator Payne’s resolution.

In conclusion, let me say that it would be foolish of us in America to relax any sound nuclear and military preparations until we can actually bring the Communist bloc nations to terms by getting them to agree to accept conditions under which there can be really effective international control of armaments of all kinds.

A fitting statement to end my remarks is credited to Albert Einstein. When asked what he felt the weapons of World War III would be,
he replied something to the effect that he did not know what weapons would be used in the next world war, but he was sure that the weapons used in World War IV would be rocks.