

Science and National Strength

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THIS EVENING I would direct our attention for a few moments toward a fundamental problem that is the mutual concern of both science and politics. It is the problem that arises from the growing power of the atom as an offensive weapon, and the lack of comparable progress in defensive measures. The continual improvement of nuclear weapons, the increasing potentialities of biological and chemical warfare, have strengthened the potentialities of the offense to such an extent that if it remains unchecked it may soon be capable of destroying our present civilization. To put it bluntly, the United States has acquired a terrific punch with which to meet an all-out war; but it has at the same time acquired a "glass jaw," because of its own vulnerability to atomic attack. The problem I would have you consider is this: How can the ideas emerging from science be employed to restore balance between the offensive and defensive capabilities that influence nations in their acts and policies, so that our choices of action are less brutally stark?

We should like to believe that by some simple act man could leash the awful forces he now has at his command. But nature is seldom simple, and it reaches its highest complexity in man himself, and in those groupings of men we call nations. However disappointing, our failure to curb these forces by honest agreement is not astonishing; so that if, by other means, we can succeed in reducing the international tensions created by the almost absolute forces of the atom, perhaps some hope for the more elegant solution of simple agreement could then be entertained.

As physical scientists we know that secrecy and security cannot prevent the ultimate development by an enemy nation of all of the nuclear power needed to destroy us. The knowledge of nature is not confined to any single people, and the history of science is replete with the parallel emergence of scientific discoveries in diverse places. Moreover, when one is so fortunate as to know where to look and what results to expect, then discovery is certain. We can only conclude that the major secret of the atom was lost at Hiroshima on August 7, 1945, and that subsequent events will not modify another nation's time scale very greatly. We must live with this situation from now on, for in the words of one of our colleagues, "The atom is here to stay, are you?" Upon this premise then, we turn to the vital question: Since we have not learned to control this force at its source, can we mitigate its effects? Putting it simply, can we produce a defense that would reduce the gross impact of the atom on civilization to something less than absolute?

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It is pretty clear that such a defense cannot be achieved through conventional methods. I believe there is almost complete unanimity of military and scientific opinion that our present methods of air defense, *taken by themselves*, offer no important solution. Even if the United States could bear the immense expense of a defense constructed around the present methods, there would be gaps that would render such a defense much less than absolute against a clever enemy.

There have been recent statements to the effect that the only real "gimmick" in making an air defense is money. This is simply not true. There are specific measures that are essential, if the cost of the defense is to be drastically reduced, and its effectiveness made real. If these measures are not undertaken promptly, the cost will be any figure you have heard. If they are undertaken, and the anticipated measure of success is achieved, the cost will be a small part of any amount that has been publicly surmised. But there is no merit in arguing these points until we get on with weapon development, so that we can agree on the most effective and the most economical measures.

Nevertheless, we are constantly admonished, "Don't worry, for 'the best defense is a good offense'". We are told by some of our military leaders that all we need is a striking force so powerful that no enemy would dare take us on. This is curious talk for a nation with a "glass jaw". Have we forgotten Pearl Harbor, when our powerful sea forces were struck down by a puny force with a puny weapon? Is our memory so short that we do not remember the two million-ton shipping losses per month that offensive action failed to prevent—losses that were reduced by 90 per cent in four short months after the most elementary defensive action, based on new methods, was undertaken? That worn cliché "The best defense is a good offense" has left a trail of lost wars and demolished nations.

At the moment, it is difficult to speak of balance in our military forces, without being accused by certain men of advocating "a Maginot Line philosophy". Such men think only in terms of extremes. Either one puts all his bets on offense, or all of them on defense; the concept of the balanced force does not enter their thinking. I submit that any military extreme is a "Maginot Line" that can be outflanked and overwhelmed. Sound military doctrine has always held that offensive action must be launched from a secure base. The mere existence of a striking force does not in itself prevent another nation, which also possesses a striking

force of total power, from engaging in all sorts of adventures that may be inimical to our interests. Must the United States face the prospect of living in an atmosphere of dread, deterred from making the mildest suggestion toward the maintenance of world order by the never-ending threat of destruction from the striking force of a ruthless enemy? Obviously something must be done about that "glass jaw".

But why should we, as scientists, worry? After all, we are only citizens, and a small percentage of the total population. But the nation has asked us to spend more than a billion dollars a year in military research and development funds, and it has a right to expect that a reasonable military position will emerge from such huge expenditures. We shall not escape criticism by saying that we have no control over the expenditure of these funds. When vital military developments are being neglected because of single-minded dependence on some outmoded concept, we cannot afford to say "Let the military worry about it". Modern atomic weapons give us but one chance.

But can we develop from technology a defensive procedure of the same relative magnitude as atomic offense? Here we come to the dilemma.

THERE ARE certainly promising directions in which we could proceed. We can visualize new weapons and tactical procedures that would plug the vital gaps in conventional systems and bring costs within reason. But since these ideas have been neither developed or tested, we cannot assert without reservation that results can be achieved. As scientists, we know that such questions are settled only when the necessary experiments have been adequately performed, and the results evaluated.

In other words, if we are to produce a respectable air-defense, we must have the opportunity to develop and test radically new weapons and systems concepts. In certain parts of the military structure there are men of vision who have pushed new weapons concepts, but there is not the general atmosphere in the military establishment, and the conviction on the part of military people in high places, that can initiate the vigorous program needed in our present situation. The opportunity to develop really important ideas is now essentially beyond our grasp, because funds under military control are not made available for the creation of new and imaginative solutions.

There is adequate assurance of the ready adoption of new weapons and tactics by our military force, *when their effectiveness has been demonstrated*. In the last war, the extraordinary ability of our armed forces to adapt themselves to new weapons and tactics was a matter of tremendous significance and satisfaction. The potentialities of new weapons and systems were unrecognized, however, *until they had been demonstrated*. Almost without exception, new weapon concepts met with severe resistance until their worth had been proven. Then they were quickly exploited. There is not

the grasp and conviction at the top that encourages follow-up of the really radical ideas. That grasp and conviction will come at the top only when demonstration is convincing. This is not a criticism of our fighting forces, for they must be able to fight with what they have. May the day never come when their effectiveness depends on something we hope to have in the future! They must be motivated by what they can see, and touch, and use, or visualize clearly. We have no right to expect their enthusiastic espousal of vague and unevaluated ideas for new weapon systems. Moreover, military men should not be held responsible for the success of weapon-development programs, when they have no access to the vital element in the process, namely the vision, imagination, and experience of the scientist who originates the concept.

This nation urgently needs a means of developing new weapons to offset our weakness in defense. There is ample evidence that really significant undertakings will not be sponsored by the military except in the event of dire emergency. But when the emergency arrives in this atomic age, it will be too late, for development takes time.

Ideas that may be vital to the survival of our nation are now lying dormant. Responsible scientists, with facts close to the very heart of our endeavor to cope with the atom, have awakened no response from the military save the usual cliché. We cannot unequivocally assert that these ideas will prove successful until they have been developed and tested in relation to our defense. But the number of germinal ideas is sufficiently great that a substantial measure of success would certainly be forthcoming.

What do we need to get on with the job? I would speak here only of the repairs that seem necessary to our scientific-military relationships and not of the larger overhaul that may be required of scientific-government relations generally. The latter is admittedly important, but the urgency of the international situation calls for prompt action in the military field.

First of all, there is clear and widely recognized need for the intelligent strategic planning that is basic to development effort. This idea has been ably developed by Dr. Bush, and certainly the Rockefeller Committee has paid serious attention to the lack of strategic planning in our present national organization. Suffice to say that strategic planning that fails to recognize the potentialities of technology is simply no planning at all. I am happy to say that in his message to Congress yesterday [April 30] the President said,

"Only by including outstanding civilian experts in the process of strategic planning can our military services bring new weapons rapidly into their established weapons systems, make recommendations with respect to the use of new systems of weapons in the future war plans, and see that the whole range of scientific information and knowledge of fundamental cost factors are taken into account in strategic planning."

HOWEVER WELL a planning staff functions, it cannot operate in a vacuum. Analysis, thinking, and judgments must be paralleled by developments of new trial weapons and tactical systems on which these judgments can be exercised. I believe that a research and development organization, independent of direct military control, is needed to exploit new ideas leading to new weapon systems. Administratively, it might operate either inside or outside the Department of Defense, though I personally believe that independent management would be better, in that creative responsibilities for both military needs and nonmilitary defense could be impartially recognized and supported. If it is to be inside the Department, it should report to the Secretary of Defense; under no circumstances should it be subordinate to the Joint Chiefs of Staff. Furthermore, the new organization should not pre-empt the research and development authority of the individual services, for new abuses would arise from the indiscriminate lumping together of groups with dissimilar objectives. The responsibilities for weapon improvement on one hand, and for new weapon creation on the other, are so different that they cannot successfully live together.

A research organization for new weapons systems must have certain requisites:

1. It must have full authority to initiate work on new weapons emerging from new ideas and directed toward the development of new and more effective tactics, capability for full understanding of the ideas to be explored, money, and the legal authority to act.

2. It must be able to deal with the military on equal terms and under circumstances in which the military are not held responsible for "any bad guesses that the scientists may make".

3. There must be intimate interchange with the military for counsel and advice as well as for operational evaluation, and transition to utilization.

4. The research organization should have access to the President, the National Security Council, and to top-level planning agencies of the Government, as well as to all information needed for its guidance in the selection of ideas to be developed. It must think of new weapon systems in a national, and not an intra-service sense.

5. It must have the confidence (and potential cooperation) of all areas of American science.

6. It must not be in competition for funds or authority with the regular programs of the armed forces for the improvement and operation of accepted and existing weapons.

7. The vigorous support and prosecution of programs toward development of radical new weapons must reflect favorably, and not unfavorably, on the careers of its staff.

To man such an organization, enthusiasts are essential. This does not mean that their ideas would not be tested and screened for fundamental limitations. But with this understood, we should let them go about their jobs with relative freedom. It was this approach that

led the OSRD to its high measure of success. Significant inventions are not made by someone who knows it can't be done; they are made by enthusiasts. The modern inventor is the highly trained university or industrial scientist whose scientific experience leads him to see new horizons.

In particular, we must avoid the heavy, clammy hand of the permanent "committee". We must ask such men not, "Will you develop a gadget having such and such specifications?" but rather, "Here is the general situation. Here is access to all the facts you may need. What can be done to acquire or retain strength in this situation?" In creative development, new concepts must emerge from the realm of technology, and new gadgets assessed, before a specification is written. Specifications are principally useful for reproducing what has already been done; as a guide for future development they discourage and divert attention from the really new and important things.

Such a research and development organization could perhaps best carry out its functions through the contract mechanisms that have already proven their worth under the OSRD, the Manhattan District, and the AEC.

In addition to the planning staff and to the research and development organization, there is a third essential element in an effective attack on our fundamental strategic problems, and that is a joint operational development group. By this I mean an operating organization equipped with airplanes, ships, guns, and all the facilities needed to develop and evaluate new tactics around new experimental weapons before they are completely emergent from the development stage. Here again are needed the same qualities of imaginative leadership that is required of the planning and of the research organizations. Such a joint group might be essentially military in character, and composed of military men and civilians with special skills. But it must be free of interservice competition, for new weapons should be given the opportunity to demonstrate what and how they can contribute to the over-all military power of the United States rather than to the power of an individual military service.

Our present total reliance on strategic striking force leaves us in the position where it will be effective only if things go as we should like them to go. It is imperative that our national strength be capable of meeting whatever situation arises, without the inevitability of terrible destruction to ourselves. Remembering that with bad strategy, victories bring no profit, while with good, defeats are matters of but little moment, we must endeavor to create the situation where, in the words of Oliver, our "strategy may be defined as a wise alliance with circumstances which, in case of success, will follow up pursuit, and in case of failure will screen the retreat".

In conclusion, I feel confident that with real vision and an organization that permits of intelligent action, much can be done to mitigate the unenviable situation toward which we are now headed.