

RADIO ADDRESSES SPONSORED BY THE OHIO ACADEMY OF SCIENCE

SCIENCE AND THE WAR

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The rôle of science in the present war appears, to the public, to be both that of the villain and that of the hero. It is accused of having brought about the conflict by its applications, and, at the same time, is expected to save the world from utter chaos. This paradox results from confusing the magic and gadgetry of applied science with the ideals and methods of science itself.

Actually, the applications of science are merely tools which men use to achieve their purposes. They are extremely powerful tools, capable of bringing about either destruction and death, or construction and life, depending upon whether or not the motives of those applying them are sinister or pure. Since war accentuates the good and evil in people and intensifies the effects of their acts, a study of the records written during wartime afford us an excellent opportunity to determine whether or not the applications of science are beneficial or harmful to the human race.

Let us examine these records for the last few wars, as supplied by the Surgeon General's Office. We learn that deaths due to battle injuries increased from fifteen per thousand for the Mexican War through thirty-three for the Civil War to fifty-three for World War I. However, the death rate due to disease for these same war periods decreased from one-hundred-ten through sixty-five to nineteen. The net death rate dropped, therefore, from one hundred twenty-five in the Mexican War to ninety-eight in the Civil War to seventy-two in the first World War.

It is perhaps too early even to estimate the likely death rates for the present struggle, but it is assuring to feel that though the implements of war resulting from the applications, or shall we say misapplications, of science have increased in destructiveness, scientific methods of combating diseases and preventing infections have been so effectively developed that those fighting now to preserve our democratic way of living may not be subjected to greater risks than those who have fought in former wars for us.

Modern warfare is unlike anything that has gone before. Someone has said it is organization for disorganization, and explained this by calling attention to the fact that offensive action always starts as a well-planned and directed spearhead at some point in the enemy line, but breaks up into individual mechanized units and fans out in all directions behind this line once it has been pierced. The column moves so rapidly that many of the troop-bearing vehicles become completely detached from the starting formation and small groups of soldiers must fight by themselves without co-ordinating orders. This is why professional soldiers have been so valuable in a blitzkrieg. Another reason is that they usually take the offensive and a defending army today is always at a disadvantage. Its troops must be spread over a wide area to anticipate a thrust at any undisclosed point. The only effective defense against a concentrated thrust of this kind seems to be a counter-offensive of the same kind. Even this can only succeed when there exists an abundance of supplies and munitions, and adequate air protection. Nothing seems to be more vulnerable to a dive bombing attack, for instance, than a column of soldiers attempting orderly retreat.

The techniques of modern warfare were highly developed by our enemy over a period of many years by careful planning and the full employment of scientific

research. Failure of the democratic countries to keep pace with them in this respect is a reflection of their general dislike for war. The previous world struggle had demonstrated the futility of bloodshed on the battlefield as a means of settling disputes.

In our own country, disarmament has always been more popular than armament. We have demonstrated our naïve faith that nations had learned the futility of war, by sinking battleships and reducing our army to a mere Federal police force. The idea of developing an "all-out" war industry based on scientific research was so far from our minds that it was hard to get the effort underway for a year or more following the outbreak of hostilities in Europe. Now we are facing a crisis and American science is being frantically mobilized on a wartime basis.

The problems of mechanized warfare are mainly technical ones. The manufacture of the weapons of war itself calls for the services of scientists and engineers. Tanks, aeroplanes, machine guns, submarines, battleships, torpedoes, bombs, all are constructed of machine parts which must be produced in large quantities yet with a precision that will permit interchange of these parts at will. The manufacture of the munitions of war calls for the operation of complex chemical plants by skilled chemical engineers without interruption. The miracle performed by American industry in converting existing factories into arsenals, and in creating new industries to meet the challenge of the emergency will be left for a subsequent speaker in this series. I merely want to comment in passing that these operations have required and still require the services of a vast army of scientists and engineers.

But it is no longer possible to win wars by sheer strength of numbers, any more than it is possible to do so by hiding behind a Maginot line. Modern wars are won by striking surprise blows, either where the enemy is not adequately prepared or with weapons for which he has not developed an adequate defense. This calls for ingenuity and originality and careful planning. It can only be accomplished by continual research and change.

In a country such as ours, wherein armies and navies are maintained during peace time at an almost irreducible minimum of strength, the problems confronting us in preparing for an "all-out" war are tremendous. We are fortunate, however, in that civilian participation in war is taken for granted in the United States, and that scientific organizations, born of war, have been maintained to assist the agencies of the Government on technical problems which they may submit. These organizations are the National Academy of Sciences, incorporated in 1863 during the Civil War by an act of Congress, and its subsidiary, The National Research Council, created by Executive Order of President Wilson in 1916, less than one year after the entry of the United States into the first World War. Neither of these institutions possess free money for research, nor do they have laboratories of their own; but they do maintain some 225 standing advisory committees composed of many of the country's leading scientists. At the best, however, these committees are fact finding groups, and have no authority to initiate projects.

At the time of our entry into World War I there was created the National Advisory Committee on Aeronautics. This agency was given more specific responsibility than the National Academy of Sciences or the National Research Council, and was charged with the supervision and direction of scientific studies of flight problems, with a view to their practical solution, and was directed to conduct research and development in aeronautics. There are 15 members of this committee including two representatives each of the War and Navy departments.

The success of this Committee prompted President Roosevelt, a year and a half ago, to create by Executive Order and establish as a division of the Office of Emergency Management, the National Defense Research Committee, with power to initiate and supervise scientific research on the instrumentalities of war. Congress appropriated about ten million dollars for this purpose. A year later a

Medical Research Committee was similarly organized to investigate problems of health related to modern warfare. Both the National Defense Research Committee and the Medical Research Committee were then subordinated to another newly created committee known as the Office of Scientific Research and Development. This committee was given \$20,000,000 to spend on researches approved by its two subsidiaries. Already over 600 war research projects have been established in university and private laboratories by this committee under Government contracts. Numerous sub-committees and sections to deal with research on specific subjects have been created in the Office of Scientific Research and Development, and at present over 500 scientists are serving as members and consultants at no cost to the country. So effective has been the functioning of this office that one is disposed to hope that it also may survive the war period as a permanent institution.

In addition to the Academy, Council, and Committees just cited, whose members are diligently seeking to develop new instrumentalities of war and new methods of defense against enemy attacks and disease, there are numerous other specially created groups working on war problems. Particularly the National Inventors Council should be mentioned. It passes on the merit of inventions submitted by enthusiastic inventors anxious to help win the war, and brings to the attention of the armed forces those which look promising. Then there are the War Products Committees, busily working on plans to provide the necessary raw materials for "all-out" war, and Health Committees striving to maintain the health and morale of the armed forces and the citizens at home, and many others in various Government bureaus.

The scientists of the country have rallied whole-heartedly to the support of their country in these perilous times. So important is their work that they must, for the most part, be individually cleared by the Federal Bureau of Investigation before assignment to their tasks. And, unfortunately, the tasks are more numerous than the men. More scientists must be trained immediately. The National Selective Service has taken this into account and promising young men are being spared from active Army duty to complete their training. They are a loyal and patriotic group. Although not many are carrying guns, American scientists are on the march.
