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War and Science

As this issue of *Science* goes to press, the tragedy of war engulfs the world. War is almost inevitably a result of miscalculation on someone's part. Despite commentators who say, "They must know they are going to lose," in most wars each side thinks it is going to win or it would not go to war.

From preliminary accounts, one of the serious miscalculations in the present war is related to the efficiency of modern warfare technology. It is difficult to understand that tactical surprise can be achieved when a deadline announced months in advance finally comes to pass. That surprise may well have been due to an assumption on the part of Saddam Hussein that night bombing could not be very effective. The number of soldiers on each side in the gulf region appears to be approximately equal, which usually means an advantage to the group fighting on its own soil, but history records that technological superiority is more often the deciding factor. Valor and heroism are the focus of novels about wars, but history has shown that, from bows and arrows to laser-guided missiles, technology is decisive if it is very one-sided.

Thus, science's role in warfare is clear. To some that is a question of mistaken priorities; our money should go into plowshares, not swords. Because no world government with sovereignty has yet been established, armies are a necessity. Even within a country, the police must use weapons, or abandon the society to criminals who are willing to use them, and a nation unwilling to maintain an army must depend on the kindness of its neighbors. That was as true in the days of bows and arrows as it is in the days of laser-guided missiles.

This time around, science seems to have changed warfare in a second category, the capacity for precision attack on military targets. The present war has so far been distinctive in that one side has the mechanical capability and the political astuteness to pinpoint military targets and spare, insofar as possible, the civilian population. In World War II and Vietnam, massive bombings were necessary to destroy key targets, and civilians died in droves. "Humanizing war" is the ultimate oxymoron, but a campaign in which military installations are the target is not only more civilized but also provides a better chance of constructing peace out of the ashes of war.

Another obvious role of science in this conflict is the enormous increase in public information. Television has changed the nature of modern warfare. In the past, heroic deeds and glamorous reports often obscured pain, suffering, and death, but television cameras looking everywhere vividly bring to people the real horror of war. It is probably an excellent inhibiting factor that no democratic government can go to war today with the hope that it will suppress the suffering of that war from its population. Of course, television can also confuse people by suggesting that simplistic slogans such as "peace in our time" will really save lives, or that "national honor" will construct a peace. Nonetheless, in the long run the added information provides a basis for informed consent by the electorate.

Science enters into this war in another way, in that it has made oil essential to modern civilization. The standard of living of many nations depends on cheap oil. Less than 40 years ago 25 percent of the U.S. labor force was involved in agricultural work. Today, one-fifth of that labor force produces three times as much agricultural product. That amazing increase in productivity depends almost entirely on cheap oil. This is only one aspect of modern life that would be dramatically changed by the loss of oil or an increase in its price. It is indeed ironic that war, which brings out the worst and best aspects of human nature, can in this case focus on a problem that society should address, regardless of conflict. In about 100 years, the world will run out of cheap oil for transportation, greatly magnifying the temptation of nations to fight over this increasingly rare commodity. Therefore, a massive research effort must be launched to provide other sources of energy before the present one runs out. In fairness to our children, and our children's children, research should start immediately on the replacement of oil, with solar energy the most likely long-term alternative. Perhaps the urgency of doing this for the sake of coming generations, a form of altruism which is tough to sell politically, may be easier to sell as a means to avoid future wars. Certainly one of our immediate priorities should be to give our nation and the world the opportunity to overcome an addiction to oil.

Science did not create warfare, but its advances can remove some of war's barbarities, can improve communication to decrease the probability of unjust wars, and can diminish the incentives for territorial conquest. Research is not only morally better than warfare, it is also more economical.—DANIEL E. KOSHLAND, JR.