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CONTRIBUTIONS OF MEDICAL RESEARCH IN CHEMICAL WARFARE TO MEDICINE[1]

By Major OSCAR BODANSKY, M.C.

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IN the war which has just ended only certain aspects of chemical warfare such as smokes, flame throwers, white phosphorus, incendiaries and fire bombs were employed. The toxic gases remained unused. Yet the potential employment of these substances was a constant threat throughout the entire course of the war. We now have abundant evidence that our enemies were prepared both offensively and defensively for the vigorous use of these agents. Their research institutes investigated the toxic properties of the agents which had been employed in World War I as well as of other agents which were subsequently developed. Our enemies studied in great detail the methods by means of which these agents could best be dispersed, and the relation of their effectiveness to varying conditions of terrain and weather; they developed protective devices, first-aid measures and methods of treatment.

But this country and its allies were at work even more intensively in these various aspects of chemical warfare. England, which was in a particularly vulnerable position because of her proximity to Germany, had maintained an active research group after World War I. When political events indicated the imminence of a second world war, research activities were intensified.

It is not the purpose of the present paper to describe the development of chemical warfare research in this and the Allied countries, but rather to indicate the contributions of such research to medicine. However, it is relevant in this connection to describe briefly the vast array of scientific forces which were marshalled in this country to study the toxic and

[1] Read on October 9, 1945, at the New York Academy of Medicine Graduate Fortnight, Beth Israel Hospital Clinic.

does not deal with his subject as something set apart from reality as many scientists do. Rather, he integrates it with our everyday lives and the lives of our children. Moreover, he gives enough of the historical and social background of the many minerals discussed to enable the casual reader to enhance his education. Incidentally, there is a quotation from John Stuart Mill on page 42 which should be required reading for every one of us.

The role which minerals play in the national defense is explained and the rate at which war depletes the reserves of exhaustible critical minerals is emphasized. We now have enough evidence to predict that war of the future will differ markedly from war of the past, both in materiel and personnel. The differences will be felt in our mineral reserves. Unfortunately it appears that the greatest load may be thrown upon the items least able to bear it, such as mica, chromium, cobalt, molybdenum and tungsten. The farther advanced our technology becomes the more we will come to depend on the rare and unusual materials.

Starting with iron ore, Dr. Hotchkiss discusses world production, use and probable reserves of the major metals: copper, lead, zinc, aluminum, tin, manganese and many of the minor metals and minerals. In each discussion he emphasizes the part which the mineral plays in maintaining our mechanized civilization and he tells us something of the effort required to win the metal from its earthy prison. I wonder if all of us truly appreciate the fact that to secure one ton of iron we must dig two tons of ore; or to secure one ton of copper we must dig 83 tons of ore! And the quality of our reserves is diminishing.

Special emphasis is placed upon depletion of high quality iron ore reserves, but Dr. Hotchkiss believes that research will solve most of the beneficiation problems and that the Lake Superior region will be our major source of supply for many years to come. Contrasted with statements relative to research making available presently non-commercial mineral bodies is the statement that magnesium is the only metal available in inexhaustible quantities. Apparently it awaits a Mushet and a Bessemer.

Water is little thought of as a major mineral resource, yet without adequate quantities of it industry as well as agriculture would suffer severe restrictions. Dr. Hotchkiss discusses water as a mineral resource in the production of power. While that use of it is admittedly of high importance other industrial uses are, too; and those he fails to mention even though it is known that the retreat of ground water supplies is giving concern to the geologists of at least two eastern industrial states.

Oil, coal and natural gas are the principal sources of energy available to us in sufficiently large quantities at prices which we can afford to pay. Dr. Hotchkiss's discussion of oil and coal while brief is sufficient to give the layman about all he needs to know to read his newspaper more intelligently and to help him understand the world negotiations now under way. The fact that coal resources in the United States are adequate for thousands of years coupled with the advances made in the chemistry of coal promises a bright future for many industries. Supplementing the discussion of coal resources Dr. Hotchkiss points out that improvements in efficiency in the use of coal are to be expected, which if consummated will extend our reserves several-fold. His discussion of energy sources is completed with factual references to the possible use of solar energy and wind power. It is interesting to note that he was as unconscious of the development of atomic energy as most of the rest of us.

Mineral resources are so important to the life of all nations that a separate section was devoted to them in the Atlantic Charter. Dr. Hotchkiss's discussion of the limitations of the language of that section are well thought out and the opinions he advances are worthy of more extended study. He also discusses the stockpiling of strategic and critical materials toward a time when they may be needed to help defend us against an enemy now unknown. His recommendation is that we stockpile material from our own reserves in order to assist in balancing employment in slack times. This reviewer is of the school which believes we should purchase material for stockpiling from abroad and leave our own reserves intact for the better development of our future—the point is controversial.

CHARLES M. PARKER

BOOKS RECEIVED

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