

The second volume, "Table of Salvo Kill Probabilities for Square Targets", contains thirty-three pages devoted entirely to the tabulation of a single probability function defined as a double exponential integral extended over a square. It is considered as a function of five independent parameters, each of which has several representative selected values, the last being the number of missiles released in salvo up to a maximum of two hundred, and the others being concerned with the dispersion and the assumed lethal probability of a single missile. The significance of these parameters is explained in detail in the introduction.

The third work, "Tables of the Error Function and its Derivative", is of considerable extent and first appeared in 1941 under the title of Mathematical Table 8. Apart from a short subsidiary section, it is entirely concerned with the tabulation of the normalized error-function

$$\frac{2}{\sqrt{\pi}} \int_0^x \exp(-\alpha^2) d\alpha$$

and its derivative $\frac{2}{\sqrt{\pi}} \exp(-x^2)$.

All the entries are to fifteen decimal places, and the ranges of x are 0 to 1 at intervals of 0.0001, 1 to 5.6 at intervals of 0.001, and a few subsequent values between 5.6 and 6. In the last range the differences between the two functions and 1 and 0, respectively, are of course extremely small, affecting only the fourteenth and fifteenth decimal places. In the short supplementary table (previously mentioned), these differences are given to eight significant figures for x between 4 and 10 at 0.01 intervals with their appropriate inverse powers of 10, the last of which is 10^{-45} . Eleven pages of introduction include details of the methods used in computing and checking the tables and a bibliography.

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PHYSIOLOGY IN COLD CLIMATES

Man in a Cold Environment

Physiological and Pathological Effects of Exposure to Low Temperatures. (Monographs of the Physiological Society—No. 2.) By Prof. Alan C. Burton and Prof. Otto G. Edholm. Pp. xiv + 273. (London: Edward Arnold (Publishers), Ltd., 1955.) 30s. net.

THIS book on the "Physiological and Pathological Effects of Exposure to Low Temperatures" has been written under the joint authorship of a biophysicist and a physiologist, and is the second of a series of monographs of the Physiological Society. The authors are to be congratulated on making readily available for the first time information largely derived from research carried out for the Armed Services. During and just after the Second World War a very considerable amount of literature accumulated, which the authors have examined and presented in a very readable form, together with the conclusions which they have drawn with great care and restraint from the varying points of view. There are both author and subject indexes, and at the end of each chapter very full references are given. The text is admirably illustrated with charts and diagrams. The first part of the monograph deals with the physical laws governing the interchange of heat between man and his environment. Towards the end of this section the authors make the important

point that "In almost every case of the general problem of enabling men to survive and function efficiently in adverse environments as at high altitude, the answer to the problem proved to be in the field of engineering, rather than in modifying human physiology"; however, "the engineering answer is not perfected without the fundamental knowledge of the underlying physiology".

The next three chapters discuss the insulation afforded by the air, the clothing and the tissues of the body. Man has been able to extend his sphere of activity both in hot and in cold climates by the use of clothes; but as yet no really satisfactory means of protecting the face has proved practical, and the exposed regions of the body play an important part in determining the 'tolerance time' of a particular clothing assembly. The chapter on the estimation of the thermal demand sets out the variables other than temperature that can affect the heat loss of the human body, and a 'unitary estimate' of these varying factors such as wind chill, corrected effective temperature, solar radiation, and radiation increment, can be introduced as a correction factor to the environmental temperature, and an estimate of the clothing requirements obtained from a single parameter. The chapter on the possibilities of maintaining a thermal steady state in the cold deals also with comparative physiology, and it is pointed out that "A survey of what methods of compensation are actually used by animals in cold environments is most useful, since it permits us to explore the possibilities of further exploitation of methods of compensation, which have not been fully utilized by animals".

Shivering is discussed under the heading of the metabolic response to cold. Recent work has shown that there is an increased 'thermal muscular tone' prior to the onset of shivering; but the question of extramuscular metabolic increments in response to cold is still open, as a great deal of evidence both for and against this increment has been produced. There is an increased voluntary dietary intake in response to cold; but so far no simple explanation of this response has been found to be tenable. Acclimatization to cold is considered under general bodily changes and local changes. There is some evidence against acclimatization to cold, and it would seem that any acclimatization sustained is only of short duration when compared with that in response to chronic exposure to heat.

Hypothermia, both chronic and acute, is discussed, and the consensus of opinion as regards the treatment of these conditions is that: rapid rewarming should be carried out in cases of acute hypothermia, and rapid rewarming with correction of the body fluid balance and administration of glucose for cases of chronic hypothermia; moderate rewarming is to be condemned. The various pathological changes taking place in response to local cold injury are discussed, and it is considered that "there is a great need for more detailed studies in this field which profitably could include more precise definition of the conditions necessary to produce mild injury".

The last chapter of the monograph very appropriately deals with problems for future research, and must act as a stimulus to those who are apt to think that this branch of climatic physiology lies dormant except in times of national emergency. The monograph is a valuable storehouse of information and should be read by everyone who is interested in the physiology of cold climates.

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