negative minerals. At the close of each section, averages for all the individuals studied are given in relation to body weight, length, and surface area. An appendix supplies an interpretation of each of the roentgenograms of the hands and wrists reproduced in Volume II. Tables for each child give the age of each of these bones in relation to the child's chronologic age.

This volume rounds out the series on interpretations where only a small number of the figures obtained could be included. By the use of many scales, it attempts to evaluate the processes of normal growth and development. Examination of the tables reveals the great variations in metabolism, not only in relation to age and sex but among comparable individuals, and in the same individual during rather closely spaced periods of study. The tables show that growth does not take place in a smooth, linear fashion but consists of a series of spurts with an occasional period of regression. Hence, it emphasizes once again the need of long-term studies in this field. The book should be of great interest to all those engaged in the study of growth and metabolism in childhood.

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Handbook of Human Engineering Data for Design Engineers. Techn. Rept. No. SDC 199-1-1, NavExos P-643, Special Devices Center (U. S. Navy). Medford, Mass.: Tufts College, 1949, 1951. Approx. 500 pp. $6.75.

This is the first systematic handbook of human engineering. In tables, graphs, and highly condensed discussion, it summarizes the available information on the characteristics of man that can help the engineer designing new equipment to realize the full potential of that equipment. The necessity of having such a book is given in a foreword by Admiral de Florez:

> We have now reached the point where the machine has dwarfed the man, for the characteristics of the individual —the human machine—have not changed in the memory of man and will not change for countless generations to come, while the man-made engine is capable of ever increasing power, scope, and speed of operation. . . . The human faculties of perception, action, reaction, and decision can now be taxed to such an extent that it is no longer possible to take full advantage of the machine unless the controls of the machine can be tailored to human capabilities . . . consequently the average man's capabilities must be analyzed, measured, and made available to the designer and engineer to make good our progress from now on.

The handbook makes available to design engineers those of man's capabilities that have been analyzed and measured. The four chapters on "Motor Responses" will illustrate the coverage and type of content. The first chapter gives an introductory discussion of basic concepts; the second and third cover reaction time; effect of sense used upon reaction time; effect of intensity of stimulus upon reaction time; individual variability in reaction time; factors affecting speed of movement; exertion of force; muscular aspects of steadiness; characteristics of rhythm, work, and efficiency; effect of work upon efficiency of other work; factors of the stimulus that influence control movements; efficiency of one- and two-handed work; effect of incentives on performance; and a number of similar topics. The data are presented in four graphs, 25 quantitative tables, and a number of qualitative "tables" giving data not yet, at least, in quantitative form. The concluding chapter gives a brief summary of the principles of motion economy.

Bibliographies to guide the reader to the original sources are scattered throughout the book. There are eight, for example, in the chapters on "Motor Responses." There is a detailed subject index, a separate author index, and a glossary.

Psychologists and others interested in man's capacities will find the book gives easy access to a great deal of hitherto scattered material. The Technical Publications Division of the engineering firm of Jackson and Moreland has seen to it that the data are presented in a form useful to engineers.

In 1949, an initial edition of 500 copies was distributed to a group of critics. Corrections, additional chapters, and revised indexes and glossary were distributed in 1951. With these changes the book has now become available in a second edition for general distribution. The physical design facilitates future changes and additions, for the chapters are separately paginated and the individual sheets can be removed and replaced. Titles of the nine parts already available are: "The Human Machine," "The Human Body," "Vision," "Audition," "Skin Sensitivity and Proprioception," "Motor Responses," "Physiological Conditions as Determinants of Efficiency," "Intelligence," and "Learning." There will undoubtedly be additional chapters and changes in these in the future, for there is much information that should have been included but for which satisfactory data do not yet exist. No one is more aware of these gaps than are the authors, who have combed anthropological and physiological literature as well as psychological sources for the extensive information they do present.

John Kennedy and his colleagues at Tufts College, with the assistance of the Special Devices Center and the firm of Jackson and Moreland, have produced a book of high merit for its content. But even more noteworthy is their demonstration that the time has arrived when it is worth while to begin to do for physiological and experimental psychology what the *Handbook of Chemistry and Physics* has long done for its subject fields.

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