A STUDY IN BIOKINETICS

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I. IS THERE A STANDARD UNIT OF MEASURE FOR PHYSIOLOGICAL ACTIVITIES?

No biologist will deny probably that the conceptions of the cell and gene as biological units have been of great value in the understanding of development, growth and heredity of living things. These concepts are doubtless as fundamental and indispensable to the morphologist as the concepts of molecule and atom are to the chemist. However, in the field of physiology, the aim of which is function rather than form, one seeks in vain for a unit of similar significance. The reason for this lies partly in the lack of control, and, if not in control, in the statement of experimental conditions.

For example, if one wishes to gather from the literature on heart metabolism the determinations of carbohydrate and oxygen consumption and to reduce them to a common basis for comparison, one finds the task almost hopeless. For some one or another important condition or factor of the experiment has usually been omitted in the report. The results may be given in grams or cc per unit of time, but the rate of beat, or the maximum tension exerted, or the weight of the contracting mass, or the temperature has not been definitely stated. How then is one to compare the metabolism of one heart with that of another, to say nothing of a comparison of the metabolism of heart muscle in general with that of skeletal and smooth muscle? If a number of reliable observations, say, on the carbohydrate and oxygen consumption of the various kinds of muscle could be reduced with certainty to the weight of these substances used up per gram of muscle, per gram tension exerted, per single contraction, one would begin to feel that one had the materials for a search for a common standard of measure of muscle activity, and indeed a promise of finding a common standard of measure for all vital activities; the point being that a smallest unit of vital activity first must be recognized and agreed upon, and second that the observed meta-