

SCIENCE

VOL. 74

FRIDAY, NOVEMBER 6, 1931

No. 1923

<i>A Study in Biokinetics</i> : PROFESSOR CHARLES D. SNYDER	443	<i>Scientific Apparatus and Laboratory Methods</i> : <i>A New Micromanipulator</i> : DR. ETHEL MCNEIL and J. E. GULLBERG. <i>A Singing Tube</i> : PROFESSOR WILLIAM R. COLE. <i>Pure Smooth and Rough Colony Types at Will</i> : AGNES J. QUIRK	460
<i>Obituary</i> : <i>Memorials; Recent Deaths</i>	449	<i>Special Articles</i> : <i>Heterothallism in Puccinia Triticina</i> : DR. RUTH F. ALLEN. <i>The Redia of the Gasterostomes</i> : DR. A. E. WOODHEAD. <i>Variations in the Evening Primrose Induced by Radium</i> : WILLIAM H. BRIT- TINGHAM	462
<i>Scientific Events</i> : <i>Appropriations for Grants-in-Aid by the National Research Council; The National Advisory Com- mittee for Aeronautics; The Dohme Foundation and National Fellowships at the Johns Hopkins University; The Lowell Lectures</i>	450	<i>Science News</i>	10
<i>Scientific Notes and News</i>	452		
<i>Discussion</i> : <i>A Forgotten Contribution to Nutrition by Ma- gandie</i> : DR. FRANKLIN C. BING. <i>A Proposed Classification of Disease Transmissions by Arthro- pods</i> : DR. CLAY G. HUFF. <i>Glauconite and Fora- miniferal Shells</i> : FREDERICK A. BURT. <i>Peat Under a Delaware Beach</i> : DR. LAETITIA M. SNOW	456		
<i>Special Correspondence</i> : <i>A Flora of Mexico</i> : DR. S. F. BLAKE	458		

SCIENCE: A Weekly Journal devoted to the Advance-
ment of Science, edited by J. MCKEEN CATTELL and pub-
lished every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal

Lancaster, Pa.

Garrison, N. Y.

Annual Subscription, \$6.00

Single Copies, 15 Cts.

SCIENCE is the official organ of the American Associa-
tion for the Advancement of Science. Information regard-
ing membership in the Association may be secured from
the office of the permanent secretary, in the Smithsonian
Institution Building, Washington, D. C.

A STUDY IN BIOKINETICS

By Professor CHARLES D. SNYDER

DEPARTMENT OF PHYSIOLOGY, SCHOOL OF MEDICINE, THE JOHNS HOPKINS UNIVERSITY

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

No biologist will deny probably that the concep-
tions 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 physi-
ology, 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 me-
tabolism of heart muscle in general with that of skele-
tal and smooth muscle? If a number of reliable ob-
servations, say, on the carbohydrate and oxygen con-
sumption of the various kinds of muscle could be
reduced with certainty to the weight of these sub-
stances used up per gram of muscle, per gram ten-
sion 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-

Science

74 (1923)

Science 74 (1923), 10-464.

ARTICLE TOOLS

<http://science.sciencemag.org/content/74/1923.citation>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.