cepts the judgment made by me in 1917, namely, that the spiral nebulae rotate in the direction of the arbor of a spiral spring that is being wound up; in his new words "they trail their arms."

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THE PERFUSION OF RAT LIVERS

J. Schiller and G. Pincus report in the November 5 issue of Science on the "perfusion of rat livers with estrogen in vitro."

In Table 1, page 412, they present data which they interpret as controverting the findings of Heller and Zondek. Upon analyzing their data, however, we find them to be entirely in accord with our concepts of estrogen inactivation as set forth in *Endocrinology,* 32: 64, 1943, and *Endocrinology,* 26: 619, 1940.

(1) Their failure to find hepatic conjugation of estrogens is wholly in agreement with our findings that this mechanism for metabolizing estrogens plays an insignificant role in estrogenic inactivation.

(2) They find that amounts of α-estradiol as large as 208 r. u. are completely inactivated by perfusion through the liver in a period of 3 hours. Only a small percentage was recovered when as much as 300 r. u. was perfused through the liver, whereas 90 per cent. was recovered when 300 r. u. was perfused through the heart for a similar period of time. If the 208 r. u. of α-estradiol had been converted to estrone or estriol by the liver, as postulated by these authors, measurable activity should have been obtained from the perfusate. The fact that they found none beyond the amount found in control perfusate experiments to which no estrogen had been added is in keeping with our data that α-estradiol is destroyed by the liver when present in small or physiological quantities. Our own experiments indicate that the destruction is accomplished with the aid of an oxidative enzyme system.

(3) When they used very large amounts (3200 r. u. in the perfusate) one third of the activity was recovered. Their data obtained through fractionation experiments are unclear, since calculation of the estrogen fractions in terms of weight shows a recovery of 650 γ (50 γ as estradiol, 400 γ as estrone and 200 γ as estriol) when only 400 γ of α-estradiol had been added to the perfusate originally. However, their biological data, showing recovery of one third of a massive dose of 3200 r. u., fit in with our concept that "the liver and kidneys have a definite threshold capacity for oxidizing α-estradiol. Any amount above the threshold will escape oxidation. . . . At least two mechanisms for dealing with estrogen occur in the body, (*a*) an oxidative mechanism which inactivates the greater part of *physiologically* circulating estrogens, and (*b*) an overflow mechanism which operates mainly after liver oxidative capacity is reached. . . ." We also conceded that this overflow mechanism involved conjugation of free estrogens or transformation of one estrogen into another.

The data these authors present thus confirm the results of our experiments, although the conclusions they reach from their own data "controvert" our findings.

Carl G. Heller

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ANTHRACITE COAL ASHES FOR ROOTING CUTTINGS

A note in Science,[1] of a few months ago, suggested to victory gardeners the use of sifted anthracite coal ashes to improve the texture of heavy clay soils. May I suggest another use for this material?

My father, who operated a successful wholesale cut flower business for many years in New York City, found during his later years that sifted hard coal ashes from the furnaces used to heat his greenhouse were excellent for the propagation of cuttings of chrysanthemums, roses, bouvardia, etc. Damping off was unknown in his cutting beds and mortality from other causes was very low. In addition, cuttings developed a fine ball of roots, and showed an exceptional vigor which the plants retained to maturity. No soil treatment was ever found necessary, water retention was adequate and aeration was excellent.

Mildred P. Mauldin

Soil Conservation Service Seed
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JOULE AGAIN

Letters covering three fourths of p. 602 in the November 20, 1943, issue of *Nature* make desirable a restatement of what was said in Science in the issue of January 20, 1933: In the summer of 1897, while being conducted through the Physics Laboratory of the University of Edinburgh by Professor P. G. Tait, I chanced to ask him how we should pronounce the name of the physicist Joule. He smiled and said, "Well, I used to work with him and I can only say that he always called himself Joule," sounding the *ou* as in *you.*

Soon after the publication of this communication of mine in Science, Sir D'Arcy W. Thompson, of the University of Aberdeen, wrote me a letter from which I take the liberty of quoting: "You are perfectly right. The matter is not in doubt. *Joule* (*ou* as in *you*) is the great man's name, and every English physicist from Kelvin and Tait downwards—or onwards—has always called him so."

[1] Science, January 8, 1943.

Yet the latest edition of Webster's Dictionary persists in making Joule rhyme with jowl, and the Standard Dictionary gives the preference to this pronunciation.

In time, I presume, the editors of those two dictionaries will concede that Joule knew how to pronounce his own name.

JOSEPH O. THOMPSON

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SCIENTIFIC BOOKS

BIOPHYSICS

An Introduction to Biophysics. By OTTO STUHLMAN, JR. 375 pp. 155 figures. New York: John Wiley and Sons, Inc. $4.00.

THIS book on biophysics was written to serve the needs of students in biology who have had one year of college mathematics and one year of college physics. The treatment of the subjects is sufficiently clear and restricted so that a student with the above preparation should have little difficulty in reading the book. The author has exercised admirable restraint in terminating his treatment of a subject before reaching the more complex aspects and has avoided the excessively descriptive treatment characteristic of biological subjects. The treatment of subjects ranges from mere descriptions of applications of physical instruments to attempted interpretations of biological processes in terms of the principles of molecular physics.

One objective in writing such a book should be to reveal the scope of biophysical investigation. This the book does well, since the chapters include discussions of cell membranes and surfaces, of properties of nerves and the special sense organs, of the action and use of various radiations and radioactive materials, and, finally, a description of the principles and uses of the compound microscope and the electron microscope. This array of subjects, though not exhaustive, serves well to illustrate the application of physical principles, methods and instruments in the solution of biological problems.

A second objective, of great importance in a first course in any science, should be to reveal or formulate a logical structure of the subject-matter. In a textbook this can be achieved not only by choice of material but by the order of presentation of this material. From this viewpoint the book is deficient because the arrangement of chapters is dictated largely by the divisions of classical physics rather than by the systematic development of a science of biophysics. Thus the first four chapters deal with some aspect of radiation in relation to organisms. Chapter one is about x-rays, chapter two deals with radioactivity, chapter three with the properties of the eye, and chapter four discusses the emission and absorption of light by biological materials. The field of chemical or molecular physics is represented to some extent by chapter five on the properties of surfaces and membranes. Chapter six is primarily about the electrical properties of nerve; sound and auditory mechanisms are taken up in chapter seven. The last chapter is a discussion of the properties and use of the compound microscope and the electron microscope. Thus are represented most of the usual divisions of physics: radiation, molecular physics, electricity and sound.

This text structure is an unfortunate one, since it has no logical order which defines the field of biophysics as a unique scientific approach to the interpretation of living processes.

However, the order of presentation of material can be rearranged, since understanding of the content of any one chapter of the book does not depend in any important way upon that of other chapters. Therefore, this book could be used to advantage even in a course organized for the purpose of giving the student an impression of a logical science based on the principles of biology and physics. In such a course the chapters dealing primarily with physical instruments and methods could be brought in as a group representing the methodology of biophysics. The limited material directly relating to cells and organisms in chapters one, two and four could be discussed in relation to cellular mechanisms rather than physical methodology. The latter is extremely important to the subject and should never be omitted. It should not, however, define the organization of material contained in a course in biophysics.

Although it may be questioned whether this book adequately represents the scope of biophysics as a distinct science, it will be a very useful adjunct to a course in physics designed for students in pre-medical and biological fields.

FRANK BRINK

POTASH

Potash in North America. By J. W. TURRENTINE. 6 × 9 in. 186 pp. Illustrated. New York: Reinhold Publishing Corporation. 1943. $3.50.

ABOUT sixty years have passed since potash fertilizers in this country were first prepared from inorganic sources. During the first half of this period the entire supply was imported from Germany. The disadvantages of dependence on a foreign source for such an essential commodity was repeatedly stressed, and the demand for a domestic source of supply increased with increase in consumption of potash in fertilizers. With a view to meeting this demand, Con-