activity could hardly equal the effects produced by passing a current through the cord itself.

(3) Similarly with the dog-fish cord. Absence of external response does not guarantee absence of conduction and responses all through the cord itself. There is another point in connection with (2) and (3) that will be returned to.

(4) The number of fiber-impulses normally passing along a vagus nerve is unknown, but compared with those evoked by tetanization with maximal stimuli is probably insignificant. The impulses continuously passing to skeletal muscle to maintain tone are, as judged by tension, less than 1 per cent. of the maximum motor impulses possible (neglecting afferent fibers). The elimination of such an amount of activity in the vagus could not be detected.

In favor of the accepted view of the functional significance of the extra oxygen consumption of activity may be mentioned the following: (a) The extra oxygen consumption agrees quite well with the extra heat production of frog nerve—although in heat measurements the region stimulated is several centimeters removed from that observed, and also the observed heat production is abolished when the nerve is blocked between the region stimulated and that lying on the thermopile. (b) Extra heat production and respiration last 10 to 30 minutes after all stimulation has ceased. (c) During equilibration, and in other conditions, the extra heat production, oxygen consumption and action potentials vary concomitantly. (d) These same changes reach a maximum with increasing stimulus strength and then do not further increase until much stronger shocks are used. This is true for oxygen consumption when the stimulus is applied within the chamber, *i.e.,* oxygen consumption does not parallel shock strength.

A control experiment to fully test the stimulus effect was reported in my initial paper (1927)[3] on this subject, and has recently been repeated by Mr. Chang, working with me. Two sets of nerves of the same frogs are mounted in the usual way on the electrodes of the two chambers of a differential manometer. On one side, the nerve trunks are cut a few millimeters from the electrodes, leaving the ends in place. On this side, then, the effect of stimulation with very little conduction is obtained, on the other stimulation plus full conduction. In two trials the increased oxygen consumption on stimulation with maximal shocks was 50 times greater on the intact side than on the cut one.

A final word on the effects of stimulation. Conduction involves, of course, successive stimulation of regions along the nerve. A stimulus, in order to just initiate this reaction, need only reach a threshold value over a microscopic region. As an electric current is increased in strength it spreads over a larger region and is able to cause excitation over this region, aside from conduction. When still more intense, electrolysis effects must begin to become serious and many secondary oxidations ensue. It must certainly be possible with strong electrical stimuli to obtain an increased oxygen consumption quite independently of the physiological response of the tissue. But with just adequate stimuli the local effect would seem, from the evidence presented, to be negligible. Professor Winterstein's failure to detect an increased oxygen consumption during activity when the stimulation took place outside the chamber must be explained, I believe, by injury to the nerve or inadequate sensitivity of the apparatus.

R. W. GERARD

WOODS HOLE

[3] R. W. Gerard, *Am. Journ. Physiol.,* 82: 381, 1927.

SETIGEROUS CYSTS IN THE EARTHWORM

IN the course of the routine dissection in the laboratory of Lumbricus, a very curious abnormality was discovered which was quite new to the laboratory staff and whose significance is not yet evident. This note is made in order to call it to the attention of others who may have observed it or who may be able to enlighten the author.

In the posterior portion of the specimen, which was of large size, obtained through the General Biological Supply House, in the segments from the eighth to the twenty-second from the posterior extremity, at least thirty-four conspicuous cysts were discovered. They were of oval form and of dirty, yellowish brown to dark purplish brown color and seemed to be lying loose in the coelom. Under ordinary low power there was no evident broken edge to indicate an attachment to the body wall, and some of the cysts dropped out simply on inverting the split end of the worm under water. In some segments as many as three cysts occurred.

Upon teasing the cysts with dissecting needles, it was found that they contained large numbers of setae of varying sizes. Some of the setae were nearly 1.5 mm in length, others only about .5 mm. Upwards of forty setae occurred in a single cyst. In one large cyst, the setae lay for the most part closely packed together approximately parallel to the long axis of the cyst. In most cases the setae were perfectly normal in form and appearance, but occasionally the chitin appeared to be irregularly split and fissured. This may have been an artifact. Besides the setae, in many of the cysts there were numerous nematodes of undetermined species. Usually there were as many as a dozen in a single cyst. Besides the adult worms there were also found bodies which looked like embryos.

The material of which the cysts were composed was rather scanty. Teasing revealed only a coarsely granular material the cellular nature of which could not be clearly distinguished. The granules were of irregular size and of varying degrees of transparency. Some appeared quite black, others were brownish or colorless.

The setigerous sacs seemed to be normal in the segments in which the cysts occurred, and in many of the segments the nephridia seemed to be perfectly normal.

No one of the laboratory staff had ever encountered these cysts, and it is difficult to see what they mean. Do the setae in the cysts represent a response to the presence of the parasites? Do they represent bits of the setigerous glands which have "run wild" like tumors?

C. P. PHOEBUS

LAFAYETTE COLLEGE

AUTO-TRANSPLANTED GASTRIC POUCH FUNCTIONING FOR FIVE YEARS

THIS note is to record the interesting fact that an auto-transplanted pouch of the fundic portion of the stomach functioned for five years. The pouch was transplanted beneath the mammary gland in a female dog in January, 1925. The fact that the pouch secreted following the ingestion of a meal was recorded by Ivy and Farrell[1] in November, 1925, the animal being demonstrated in Cleveland at the meetings of the American Physiological Society[2] in December, 1925. This fact proved the existence of a humoral mechanism for gastric secretion. Observations on the motility of the pouch have been recorded,[2] the most important observations being that when the stomach proper manifested "hunger contractions" the pouch also manifested "hunger contractions," and that the ingestion of food not only inhibited the hunger contractions of the stomach, but also those of the pouch, which demonstrated that a humoral mechanism plays a rôle in the causation of the hunger motility of the stomach. These observations have been repeated and confirmed at intervals on this particular dog for five years. The secretory and motor functions of the pouch continued until the animal contracted an infectious jaundice and pancreatitis which resulted in death in June, 1930. A histological study of the pouch immediately after death revealed the same partially atrophic changes recorded in a previous article.[1]

A. C. IVY

NORTHWESTERN UNIVERSITY MEDICAL SCHOOL

SCIENTIFIC BOOKS

Astronomy. By R. H. BAKER. xix + 521 pp. Van Nostrand Company, 1930.

A TEXT-BOOK for introductory college courses in astronomy. The author, who is professor of astronomy at the University of Illinois, has purposely eliminated mathematics where practicable, and does not presuppose any considerable knowledge of physics. With these limitations the author has succeeded remarkably well in giving a picture of the science at the present day.

This book was needed. Many good text-books on astronomy have recently appeared. Yet some of them are too easy for a course of three hours a week during a whole year, and some are too difficult. Professor Baker's book is just what one requires for such a course.

In some respects his desire to avoid mathematical treatment may have been too great. The sections which deal with solar and lunar eclipses, for instance, do not contain any algebraical formulae at all. But in order to explain the phenomena some recourse to "algebra in words" was necessary. Would not even mathematically ill-equipped students prefer some simple formulae?

The book is beautifully printed. The illustrations are well chosen and well reproduced. Figures 10.25, 10.25A on p. 418 are obviously misplaced. One wonders what these pictures of constellations have to do with "the importance of radiation pressure," the subject of the corresponding section.

Some misstatements occur in the section on the variation in the speed of the earth's rotation (p. 52). It is stated that meridian transits of *stars* exhibit fluctuations due to irregularities in the earth's rotation. This is obviously confusing, as they are just the readings on the earth-clock. We further read: "From 1660 to 1790 the earth ran fast; then it ran slow until 1898 when it became fast again." Fast and slow should be interchanged. There is an amusing misprint in the preceding sentence: ". . . sudden changes in the period of rotation, at times as much as $0.^{s}00$ . . . [occur]."

Concluding the section on tides in the solid earth (p. 173), the author states, erroneously of course,

[1] *Am. J. Physiol.*, Volume 74, 1925.
[2] *Am. J. Physiol.*, Volume 76, 1926.