nary experiments indicate that the "arsenic fungi" will readily attack some of the arsenites used.

Certain conclusions are indicated:

(1) Arsenic fungi are more numerous than was previously supposed. Some saprophytic species common in the soil are active in the production of arsenical gases.

(2) Arsenic tolerant forms include many species which do not decompose arsenic compounds with the evolution of gases.

(3) Arsenical substances carried to the soil come in contact with decomposing agents, which tend to break them into volatile or quickly soluble forms. Accumulation of arsenic in the soil may be expected to occur only when massive amounts are used or under special conditions unfavorable to the development of a varied microflora.

(4) The disintegration of arsenical compounds may be caused by a considerable variety of fungi. Presumably, therefore, it is of sufficiently common occurrence to warrant the avoidance of arsenical preservatives for materials to be utilized in enclosed areas.

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## WORK OUTPUT OF RATS SUBJECTED TO CONTINUOUS FARADIC STIMULATION

IN a preliminary study of work output in intact, anesthetized animals, using methods described below, it is possible to produce periodical muscular contractions for long periods of time.

Previous studies on rats and other animals have been supposed to demonstrate that skeletal muscle can be completely fatigued in a relatively short time. By the use of modified methods, however, in which the gastrocnemius muscle is subjected to faradic stimulation, it is possible to maintain a high level of work output for upwards of ten days, during which time the muscle lifts a 100-gram weight at the rate of three times per second. At the end of this time it is necessary to suspend experimentation because of complicating factors, such as general emaciation, edema, infection and other conditions of the muscle.

Although some decrease in output is noted throughout the work period it is believed that the complicating factors mentioned above are in large measure responsible for the more pronounced decrease observed near the end of the experimental period. At no time, however, does the working muscle show signs of complete fatigue. On the contrary, a fair level of output is maintained up to the time the animals are removed.

The total amount of work, as calculated for each animal by the aid of an automatic recording device, is found to range between 105,000,000 and 177,000,000 ergs. This is only a rough approximation, however, since such factors as friction and inertia have not been allowed for in making the calculation.

In so far as the writers have been able to determine, both the time and work records obtained are considerably greater than any previously reported. It is believed that this greater amount of work is due primarily to differences in method employed. In trying various methods it was found, for example, that activation of the muscle by stimulating the peripheral portion of the severed sciatic nerve was accompanied by dying of the nerve, a rapid loss in muscle irritability and consequently a shortened work period. This shortened work period or supposed "fatigue" proved therefore to be an artifact of the dying of the nerve and did not give a true picture of the muscles' capacity for energy output.

It was further found during the course of the investigation with both the direct and indirect methods of stimulating the muscle that the work output varied considerably with differences in the type of shock used, such as changes in amperage and voltage, frequency and time relations of the stimuli and the direction of the flow of current.

The methods and apparatus used and the results obtained in the present study will be reported in detail in a later paper.

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## BOOKS RECEIVED

BARTLETT, F. C. *Remembering.* Pp. x + 317. Illustrated. Macmillan. $5.00.

BROWN, A. E. *Workbook in Elementary Psychology.* Pp. iii + 182. Macmillan. $1.25.

EMMONS, WILLIAM H., GEORGE A. THIEL, CLINTON R. STAUFFER and IRA S. ALLISON. *Geology.* Pp. xii + 514. 478 figures. McGraw-Hill. $4.00.

FOWLES, G. *Volumetric Analysis.* Pp. x + 202. G. Bell & Sons, London. 6 s.

FRED, EDWIN BROUN, IRA LAWRENCE BALDWIN and ELIZABETH MCCOY. *Root Nodule Bacteria and Leguminous Plants.* Pp. xxii + 343. 46 plates. University of Wisconsin Studies. $3.00.

HORWOOD, MURRAY P. *The Sanitation of Water Supplies.* Pp. xi + 181. 26 figures. Thomas. $3.00.

JOHNSON, BUFORD J. *Child Psychology.* Pp. xii + 439. 50 figures. Thomas. $4.00.

PARKS, BRYAN and J. M. HANSELL. *Black Marbles of Northern Arkansas.* Illustrated. Arkansas Geological Survey.

WALFORD, LIONEL A. *The California Barracuda.* Pp. 122. Illustrated. California Bureau of Fisheries.

WEYER, EDWARD M. *The Eskimos.* Pp. xvii + 491. Yale University Press. $5.00.

WIELAND, HEINRICH. *On the Mechanism of Oxidation.* Pp. x + 124. Illustrated. Yale University Press. $2.50.