

verdin. The molecular weight of this protein can not be calculated until its diffusion constant has been determined; but the results of Svedberg³ indicate that a protein with $s_{20}^0 = 11$ will probably have a molecular weight of the order of 300,000.

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A BIO-ELECTRIC RECORD OF HUMAN OVULATION¹

THROUGH the cooperation of a patient in whom a laparotomy was indicated, it has been possible to obtain a continuous graphic record of a voltage difference existing between the symphysis pubis and the vagina for 57 hours. This period included within its limits a predicted time of ovulation based upon day to day observations of the preceding four months.

At noon on July 24, the vagina was negative to the symphysis about ten millivolts. During the next seven hours the vagina gradually became positive until at 7 o'clock it reached thirty millivolts. At 7:05 the recorder was thrown clear off scale, but when the zero point was shifted the voltage record registered between seventy and eighty millivolts. During the next twenty-five minutes this steadily declined until at 7:35 the voltage difference was thirty millivolts, with the vagina still positive. This condition continued until midnight, when the experiment was terminated in order that the patient might obtain a night's rest. At 9:30 A.M., July 25, a laparotomy was done, the ovaries examined and in the left ovary the bright punctate hemorrhage of a recently ruptured follicle was found. Fortunately, this was located at one pole of the ovary. It was resected and immediately fixed in Zenkers.

This observation confirms and extends the studies of Burr, Hill and Allen,² Greulich and Hill,³ and Reboul, Friedgood and Davis.⁴ Moreover, it is clear that the use of the Burr-Lane-Nims technique enables one to determine with certainty and accuracy the time of ovulation in an intact human being. A complete account of the observations will be published elsewhere.

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³ T. Svedberg, *Chem. Rev.*, 20: 81, 1937.

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² H. S. Burr, R. T. Hill and Edgar Allen, *Proc. Soc. Exp. Biol. and Med.*, 33: 109, 1935.

³ W. W. Greulich and R. T. Hill, personal communication.

⁴ J. Reboul, H. B. Friedgood and H. Davis, *Am. Jour. Physiol.*, 119 (2): *Proc. Am. Physiol. Soc.*, 387, 1937.

THE LIFE CYCLE OF *MONIEZIA EXPANSA*

OVER one hundred species of anoplocephaline cestodes have been described from mammals, birds and reptiles. They are common in herbivorous animals and occur infrequently in man. The development of these tapeworms has been studied repeatedly for the last fifty years. It is noteworthy that, despite their prevalence, wide distribution and economic importance and despite the attempts of numerous investigators to discover the life history, the developmental cycle of these tapeworms has remained an unsolved mystery. The strobilate, sexually mature stage of the cestodes occurs in the intestine, and eggs of the parasite are voided with the feces of the host, but the course of subsequent development and manner by which the final host is reinfected have been entirely unknown. Stunkard¹ has reviewed previous studies on the life cycle of anoplocephaline cestodes and reported experiments, carried on during 1931-1933, which demonstrated that direct infection is impossible and that an intermediate host is necessary for the completion of the life history. The statement was made that the information then available was sufficient to indicate the character of these hosts with much assurance. The bionomic features of the intermediate hosts of this family of cestodes were clearly delineated.

Since 1933 various minute terrestrial invertebrates, chiefly insects, have been used in experiments to determine the life history of the anoplocephaline tapeworms. In the spring of 1936, it was discovered that free living mites would eat the cestode eggs, that the onchospheres would hatch in the intestine and migrate to the body cavity of the mite. In the succeeding months, various tyroglyphid and oribatid mites have been exposed to infection. *Moniezia expansa* is one of the most common and important of these cestodes. Eggs of *M. expansa* were fed to specimens of *Galumna* sp. and the onchospheres recovered in large numbers from the body cavity. Since this mite appeared to be a likely intermediate host, it was used extensively. Thousands of specimens have been exposed during the past year and dissected at various intervals after feeding on *Moniezia* eggs. In this way a series of developmental stages, from the onchosphere to the infective cysticercoid, have been recovered from the body cavity of *Galumna* sp. These results demonstrate the correctness of the conclusions expressed in the paper by Stunkard (1934). The discovery of the life history of *Moniezia expansa* solves the problem of the life cycle among anoplocephaline cestodes. A more complete description of the larval stages will be published elsewhere.

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¹ *Zeitschrift für Parasitenkunde*, 6: pp. 481-507, 1934.