movement, the sidewinding or rolling movement and the caterpillar movement. The first one is the typical serpentine wriggling, the method used by most snakes for rapid locomotion. It is produced by the progression of transverse waves over the body of the snake from the head to the tail, principally like the movements of many aquatic animals in water. These transverse waves result in the displacement of each point of the snake's length in a direction approximately normal to the direction of locomotion, if there is no lateral resistance, as on a glass plate, where because of the side slippage, the snake's wriggling is futile, not resulting in progression. Under natural conditions the ground always furnishes points of resistance in the form of rocks or pebbles, the stems of plants or simply small unevennesses. The snake uses

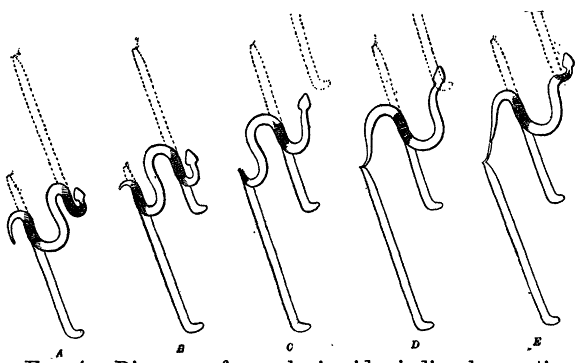

FIG. 4. Diagram of a snake in sidewinding locomotion, representing 5 phases. Only the shaded parts of the snake touch the ground. The formation of parallel, oblique, disconnected tracks is shown.

these points of resistance by applying its curves to them, whereby mainly the body portions midway between two successive vertices are pressed against the projections of the ground. Then any side slippage is avoided by the half cylindrical shape of the body and especially by the sharp keels present in many snakes along the flanks. Every point of the snake's body and tail faithfully follows the path taken by the head and neck, so that the snake seems to flow gracefully through grass and shrubs like a water course in its narrow, winding bed. The diagram Fig. 3 shows how the forces brought about by the horizontal undulations are transformed into progress in the longitudinal axis. The main work is done at the points midway between two vertices of the sinuous curve; here the forces are greatest, gradually decreasing towards the vertices, where they may be zero. The ventral scales are of no use in the horizontal undulatory movement.

The sidewinding or rolling movement is applied by viperide snakes inhabiting sand deserts, namely, the members of the genus *Cerastes* in the Sahara and the "Sidewinder" (*Crotalus cerastes*) in the southwestern deserts of the United States This progress is principally like the sidewise rolling of a circular helix or screw—the tracks left by a wire helix being, like those of a sidewinding snake, a series of disconnected equidistant and parallel bands, set at an angle to the direction of motion, each as long as the helix (or snake, respectively). The advantage of this type for the sandy habitat consists in its not requiring any resistance or reactions of the substratum, except that the latter has to carry the weight of the snake.

The caterpillar movement is the one method in which the ventral scales play that important rôle which was formerly attributed to them for snake locomotion in general. It consists of an alternate movement of the skin on the body and of the latter within its tube of skin. First the skin is pulled forward, then it is anchored on the ground, whereby the ventral scales catch points of resistance, and the body is pulled forward until the corresponding portions of integument and body are in touch again. The ribs are not employed in the sense of the "rib walking" theory maintained by former authors. The movement described proceeds rhythmically from the head tailward. By this method a snake can glide slowly forward, stretched out fully or slightly undulating. The caterpillar movement is applied mostly by thick-bodied snakes like Boidae and Viperidae, *e.g.*, rattle snakes. Finally, snakes can move by alternately bending and straightening portions of their bodies. Speed-testing experiments with the famed "Blue Racer" have shown that the apparent rapidity of many snakes is a psychological delusion rather than actual speed in meters per second. However, more extensive tests along this line are desirable.

The author is at present engaged in an investigation dealing with the locomotion and the locomotor adaptations of sand reptiles.

OBITUARY

JUNE ETTA DOWNEY

THE University of Wyoming lost its most distinguished scientist when Dr. June Etta Downey, professor of philosophy and psychology, died on October 11, 1932. Dr. Downey was born in Laramie, Wyoming, on July 13, 1875, and resided there throughout life. Her researches in the fields of handwriting, imagery, "will-temperament" testing, handedness and esthetics earned for her international recognition.

Dr. Downey was graduated from the University of

Wyoming in 1895. Her early interests were artistic and literary. As an undergraduate and during the first few years of her teaching, she was introduced to many of the concepts of natural science by the late Dr. Edwin E. Slosson, who was professor of chemistry at the University of Wyoming from 1891 until 1904.

In 1898 Dr. Downey received the A.M. degree from the University of Chicago. The summer of 1901 was spent in the laboratory of Edward Bradford Titchener at Cornell University. She returned to the University of Chicago in 1906, and a year later received the Ph.D. degree upon the completion of her dissertation, "Control Processes in Modified Handwriting." Her graduate work was done under the direction of Dr. James Rowland Angell.

Dr. Downey was more interested in motor responses than in sensory phenomena. Her interest in handwriting persisted throughout life. Muscle reading engaged her attention about 1908. She noted personality differences that she described under such trait names as "freedom from inertia," "motor impulsion," "motor inhibition," "reaction to opposition," etc.

For ten years Dr. Downey experimented with handwriting procedures and ingenious test situations that would indicate the personality differences which she recognized. In 1919 she presented her test results in a bulletin, "The Will-Profile: A Tentative Scale for Measurement of the Volitional Pattern." The Individual Will-Temperament Test represented a pioneer effort to measure three aspects of personality: (a) the fluidic, speedy, "hair-trigger" type of response, (b) the dynamic, aggressive, forceful type, and (c) the slow, deliberate, inhibited type. Instead of a total score, Dr. Downey advocated the plotting of a graph, or "will-profile," to show the differences in the personality make-up of an individual. She viewed personality as an integrated whole, and reacted against the tendency to abstract a trait from its setting. Her pioneer work has stimulated a vast amount of research in the field of personality evaluation.

The best-known books and monographs of Dr. Downey include "The Will-Temperament and Its Testing;" "Creative Imagination;" "The Kingdom of the Mind;" "The Heavenly Dykes," (a volume of poems); "Plots and Personalities" (with E. E. Slosson); "Graphology and the Psychology of Handwriting;" "The Imaginal Reaction to Poetry;" "Muscle Reading: A Method of Investigating Involuntary Movements and Mental Types"; "Control Processes in Modified Handwriting," and "Types of Dextrality and their Implications."

Dr. Downey was an indefatigable worker. She was kind, generous and human, and never lost sight of personal values. As a steady, persistent worker in her chosen field of personality evaluation she blazed a trail for others to follow.

R. S. UHRBROCK

SCIENTIFIC EVENTS

EXTENSION OF THE PLYMOUTH MARINE BIOLOGICAL LABORATORY

IN the past, investigations carried on at the Marine Biological Laboratory at Plymouth, England, have been chiefly devoted to morphological and fisheries research. Emphasis has been placed upon the latter because of the fact that the station has been subsidized by the national government and by commercial organizations, both of which were of course interested in "practical" results. Nevertheless, there is a growing number of physiologists and ecologists who work regularly at Plymouth, and it is the intention of the directors to further increase the scope and facilities of the laboratory.

During the past summer (1932), an addition to that part of the buildings known as the "new wings"[1] was completed. This latest portion, built with the aid of the Rockefeller Foundation, consists of eight private working rooms, a large physiological laboratory, and a similar chemical laboratory. There is also an up-to-date dark-room and photographic room. Beneath the building is a cellar hewn out of solid rock and fitted with a vibration-proof pillar. Here studies can be made under cool conditions. Abundant material for zoological, botanical, physiological, and biochemical research may be obtained from the waters of Plymouth Sound, and the laboratory staff makes every effort to secure special materials which workers require. The sea-water circulation in the aquaria runs through storage tanks, but outside sea-water is also provided. The whole laboratory occupies a very pleasant position on Citadel Hill, overlooking Plymouth Sound.

Foreign investigators have always been welcomed at the laboratory and are usually allowed to occupy tables without payment. Space is now available for about fifteen more workers than could previously be allotted places, and, together with other improvements, the Plymouth station offers considerably greater advantages along the newer lines of biological research than formerly.

J. P. SCOTT

[1] For a detailed description of the entire laboratory, see: Allen, E. J., and H. W. Harvey. 1928. The laboratory of the Marine Biological Association at Plymouth. *Jour. Marine Biol. Assoc.* U. K. 15: 735–828. The laboratory also publishes a fauna list of the Plymouth region, obtainable at Plymouth.