tilized to produce females) or they are partially arrhenotokous and partially thelyotokous. Since it is unlikely that the change in host plants would cause the chromosome number to change in all the cells of the germarium, it is logical to assume that irrespective of the host plants the females are uniparental and that the production of males when the peach is the host plant is the result of the occurrence of patches of diploid tissue in ovaries that otherwise are tetraploid.

Stanley E. Flanders

University of California,
Citrus Experiment Station,
Riverside, Calif.

DIFFERENTIATION OF THE LATERAL MOTOR COLUMN IN THE AVIAN SPINAL CORD

It has been shown that the periphery is necessary for the differentiation of the lateral motor column in the embryonic chick;[1,2] also, that this process completes itself to a large extent after the brachial and lumbosacral spinal cords have been isolated from the rest of the nervous system.[1,3] Because of the importance of the peripheral musculature, it was thought that it might be possible to induce a lateral motor column in non-limb segments of the spinal cord from a 2½ day chick embryo. These non-limb segments were removed and transplanted so they would be under the influence of the developing hind limb primordium. In no case was it possible to induce a lateral column.[3]

Brachial spinal cord segments will differentiate a lateral column which will be within 30 to 60 per cent. of the normal number of cells when grafted so as to develop in the presence of the growing hind limb.[3] This indicates that the peripheral requirements for the brachial cord are at this time highly non-specific as to level. Because of the non-specificity of the periphery as to region, it was thought that the peripheral requirements might be non-specific as to genus and species. To test this possibility the lumbosacral spinal cord of the guinea hen (*Numida meleagris*) embryo of 2½ days was removed and transplanted so that it would be under the influence of the developing hind limb of the chick (*Gallus domesticus*). Ten grafts were completed; three were successful. After a total of 9 days incubation the grafted guinea hen spinal cord had given off peripheral nerves which had fused with the lumbosacral plexus, and the side which was next to the limb had a well-developed lateral motor column. The cell count of this column for the three cases studied was within 20 to 50 per cent. of that for the control.

1 V. Hamburger, *Jour. Exp. Zool.*, 68: 449, 1934.
2 E. D. Bueker, *Jour. Exp. Zool.*, 93: 99, 1944.
3 E. D. Bueker, *Anat. Rec.*, 88: 424, 1944.

The above evidence indicates that the limb periphery of another genus is an adequate environment for making possible the partial development of the lateral motor column, and that the peripheral requirements are not specific as to location, since the wing level will differentiate a column when grafted in the leg region. To get the maximum differentiation, however, the volume, growth rate and developmental pattern of the musculature must be that for which the particular segments of the spinal cord are adapted and only the normal periphery can meet these requirements.

E. D. Bueker

Department of Anatomy,
Medical College of the State of S. C.

SNOW MELTING AND EVAPORATION

Melting and evaporation of snow during the winter and spring seasons on the high mountains and plateaus of the Intermountain region are processes of considerable interest to water users in the adjacent arid valleys because they have a direct bearing on the timeliness, rate and amount of streamflow that becomes available during the remainder of the year for irrigation, power and other purposes. Records show that snow accumulates on the watershed lands during the period November 1 to April 1 to depths of from 4 to 10 feet, and that the snow mantle just prior to active melting in the spring may contain from 10 to 50 inches of water. Relatively little is known, however, about the rate at which the snow melts or the amount of water that is lost from the snow mantle by evaporation. To augment the meager knowledge of these phenomena, preliminary studies of snow melting and evaporation were conducted at elevations from 8,700 to 10,000 feet on a portion of the Wasatch Plateau in central Utah during the snow melting season of 1942, some results of which are herein presented.

The snow mantle on a study area at 10,000 feet elevation was 60 inches deep and contained 23 inches of water when measurements of melting began on April 29. All the snow originally on the area, together with an additional 2 inches which fell during the period of measurement, was gone by June 1. During this 33-day period, melting took place only in the daytime, usually from about 2 hours after sun-up to within one-half hour of sun-down. Melting rates varied from 0 to 1.97 inches of water per day by reason of differences in temperature, insolation and air movement.

Snow temperature throughout the daytime melting periods remained at about 32° F., although air temperatures up to 67° F. were recorded at a distance of 4.5 feet above the snow surface. At night a crust often formed on the snow surface which extended to depths of from 1 to 4 inches. Temperatures of 32° F.

were recorded consistently at the contact between uncrusted and crusted snow, whereas they dropped to as low as 14° F. at the surface of the snow crust. Air temperatures at 4.5 feet above the snow mantle rarely dropped below freezing and usually were about 5 to 10 degrees higher than those of the snow surface during the crusting period.

Daily snow-melt was reduced artificially at some of the sampling stations by shading and by minimizing air movement. On May 8, for example, snow-melt in bright sunshine with free air movement totaled 1.3 inches. Total melt in the same day was 0.89 inch on a shaded site with free air movement and 0.47 inch on a shaded site with restricted air movement.

Discoloration of the snow surface increased snow melting on other sites. The daily melt of clean white snow giving a Weston photometer reading of 220 averaged 1.2 inches as compared to 1.3 inches for normal snow giving a Weston reading of 200. Snow surfaces which were darkened by applications of dust and soot so as to give Weston readings of 180 and 150, respectively, melted at rates of 2.0 and 2.4 inches per day.

Rates of snow melting during the day varied from 0.014 to 0.205 inch per hour. Inasmuch as no surface run-off occurred on the site throughout the study period, it is evident that melting was sufficiently slow for all the water to enter the soil at or near the spot where it was released from the snow mantle.

Evaporation from snow during 6 days of measurement between April 28 and May 21 at 8,700 feet elevation varied from 0.005 to 0.07 inch of water per day. The average evaporation for these 6 days was 0.04 inch or the equivalent of about 1.20 inch per month. Greatest evaporation occurred on days when the vapor pressure of the atmosphere at the snow surface was materially greater than at 2.5 and 12.0 feet above the surface. Least evaporation occurred when vapor pressure of the atmosphere approached that at the snow surface. Vapor pressure of the atmosphere exceeded that at the snow surface for a short time on one of the days of record and probably caused some condensation of moisture, although the amount was not measured.

Evaporation during two days in early May averaged 0.54 inch per day on a site having full insolation and free air movement. During the same period, average daily evaporation was 0.52 inch on a shaded site with free air movement and 0.23 inch in the shade with no air movement. Thus, whereas shading alone had little effect on evaporation, a 50 per cent. reduction in evaporation loss was achieved by minimizing the movement of air over the snow surface. Stands of trees and other vegetation are known to have a pronounced stilling effect on the atmosphere near the ground surface. Further studies are needed to determine the amount of water lost by evaporation of snow during the entire season of snow accumulation and melting and the extent to which manipulation of the plant cover on the western watershed lands will decrease this loss and thereby increase ground water and streamflow.

A. R. CROFT

INTERMOUNTAIN FOREST AND RANGE
EXPERIMENT STATION, U. S. FOREST SERVICE,
OGDEN, UTAH

SCIENTIFIC BOOKS

VERTEBRATE PHOTORECEPTORS

Vertebrate Photoreceptors. By SAMUEL R. DETWILER. 10 + 184 pp. New York: The Macmillan Co. 1943. $4.00.

FROM time to time a book appears that contains precise technical information, presented so simply, clearly and interestingly that it makes good reading for scientist and layman alike. Such is this latest publication in the series of Experimental Biological Monographs. As the title suggests, the author has largely limited his presentation to the structure and activities of the visual and pigment cells of the retina. By so doing he does not invade the field covered by the intensive treatise of Polyak ("The Retina," 1941); there is, likewise, only partial duplication of some of the topics more exhaustively treated by Walls ("The Vertebrate Eye," 1942). Professor Detwiler, though presenting no small amount of detailed information, aims rather at the biologist who is not professionally concerned with the photoreceptive apparatus but who wishes to know its present status as an adaptive visual-mechanism. Other beneficiaries are the non-biological scientist with catholic intellectual interests and the clinical ophthalmologist.

The first 59 pages are devoted to pure morphological description. In them the author presents the background-material necessary to an understanding of the rest of the monograph. After a preliminary chapter on the plan of the vertebrate eye as a whole, the organization of the retina is described. Here the reader may obtain a digest of the far-reaching and revolutionary concept of Polyak concerning the types of neurones encountered in the primate retina, their synaptic relations and the paths taken by retinal impulses. The next chapter deals with the structure