would be of advantage by the hold they would give to the squirming body. Then elongation would increase the advantage. No loss of this function would be necessary, but a gain, if the limb acquired some independent motion, and this might be developed enough to render it capable of officiating as the sole locomotive organ. If such a history of the limb were true, the salamander is midway in the line of descent.

3. The *post-anal region* of the salamander is piscine, while the anterior portions of the body are not, but are distinctly higher. This fact is more or less familiar in a general way and called by Professor Hyatt, who pointed it out many years ago, by the name "cephalization." This advance of the anterior part of the body of the salamander has left the "tail" to be in many respects not amphibian so much as piscine. Of course the term tail here means post-anal region of the body and the portion, roughly speaking, homologous with the post-anal region of the fish. In the higher fishes this region has acquired a "tail," while the amphibia have not shared the acquisition of a structure supported by five rays, which does not belong to the ancient vertebrate stock. In this sense the tail of the salamander and its correlate, the post anal region of the fish, are not only similar in function, being organs of locomotion, but they are comparable in their anatomy. The back-bone is acentrum with bi-concave surfaces with two equally developed arches, a neural arch containing the spinal cord, and an haemal arch containing a vein and an artery with oblique intervertebral muscles forming the back of the organ. In vertebrates above the urodela, with the loss of its locomotor function and the development of arms and legs, the post-anal region becomes of less and less importance, though not always disappearing; thus in many lizards it is large at its origin, as large as the body before it, and it has the peculiar power of *autotony*, as it has been called; that is, of breaking off in the hands of a captor, whereby the animal escapes capture. There is a gradual degeneration of the region among the higher vertebrates, with many varieties of direction and degree of development and occasional utilities in peculiar directions, and the salamander stands at the bottom of this series.

4. The *death of the salamander* is accompanied by a loss of powers of movement, which is first manifest in the last acquired (phylogenetically) of the powers, i.e., in the limbs, and finally in the vertebræ muscles. In specimens killed under the influence of chloroform, after all movement had ceased in the limbs, the sinuations of the back-bone continued for some time, and were the last movements observed to take place.

REFLEX ACTION IN TURTLES.

BY M J ELROD, ILLINOIS WESLEYAN UNIVERSITY, BLOOMINGTON, ILL.

RECENTLY I had a number of map turtles (*Malaclemys geographicus* Le Sueur) for student work, and observed, what is to me, a remarkable instance of reflex muscular action, both in the head and limbs. In one specimen the head had been severed from the body fully an hour, when I observed the students amusing themselves by tapping the nose of the severed head, when almost as quickly as in life the jaws would open, and when a pencil or other hard object was thrust in would close upon it with seemingly as much viciousness as in life, continuing to hold for some time, gradually relaxing, when the experiment would be tried over again. This was the case not only with the one in question, but with a half-dozen others of the same lot. Taking a specimen with the head cut off and all the viscera cleared away, leaving the legs attached to the carapace, the legs manifested sensitiveness to a marked degree. In one specimen the four legs extended from the body almost straight; a very gentle touch with the point of a pencil on the tip of a claw caused that leg to be drawn within the shell, so to speak, as quickly as in life. This was done alternately with each foot to the first again, all giving the same results. Several other specimens tested showed as much and as sudden movement, and one killed at 2 P.M., when touched at 11 A M. the day following, withdrew its feet instantly. While these observations are common for turtles, I have not observed such marked results in other species.

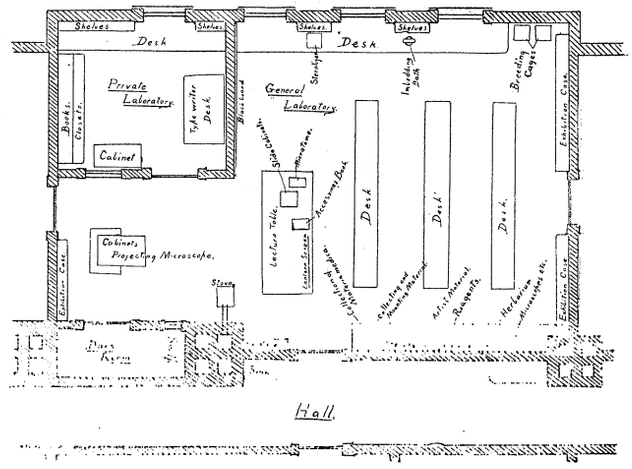
A LABORATORY OF PLANT DISEASES.

BY C. W. WOODWORTH, BERKELEY, CAL.

THERE has recently been equipped at the University of California a laboratory for the study of the subject of plant diseases in its broadest sense; and, as there are but few if any others where the whole subject is taught as a unit, it may be well to give an outline of the equipment for this class of work.

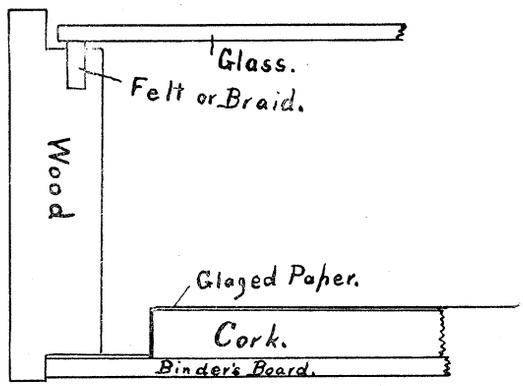
We will not consider that part of the equipment for this work afforded by the grounds, orchard, nursery, gardens, and greenhouses of the agricultural department, but confine ourselves to the laboratory proper. The subject of plant diseases is now, and will continue to be, associated with that of entomology, so that the same equipment, to a considerable extent, serves for the two subjects.

The laboratory-room is something over twenty by thirty feet, and is situated on the north side of the Experiment Station building. It is lighted by four windows, having an entirely unobstructed view, and so giving ample light for microscope work. A corner of the room is partitioned off for a private laboratory, and a closet is fitted with a ruby window, affording an opportunity for photo and blue-print work. The figure below will give a good idea of the arrangement of the room.



The windows are all fitted with heavy shades working in grooves, enabling one to darken the room very easily and quickly when the lantern is to be used for illustration. The views are projected on a screen of tracing-cloth, which is mounted on an ordinary spring-roller and is ordinarily rolled up out of the way.

Besides the benches near the windows, which are used by advanced students, there are also three long desks, one and a half feet wide by twelve in length, that have proven themselves so convenient that a sketch of one is presented. As can be seen on the plan, these are so constructed that at the side of each student boxes, the size of those of the collection, may be used as drawers, or boards may be inserted forming shelves.



The boxes used for the collection are made as shown in the accompanying figure, and are from their peculiar construction not liable to warp or crack, and so remain perfectly insect-proof.