

PHYSIOLOGICAL
BOTANY.

MICHIGAN
AGRICULTURAL COLLEGE.

SPRING TERM
1886.

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Class of '88.

Notes of Elementary work in which no drawings were made.

Examine with moderately high power, some curious projections from the walls into the cavities of epidermal cells. They are mostly cylindrical with a sort of knob on the end, and the longest are nearly half as thick as long. They are called Crystoliths, and in many respects resemble Crystals.

In a cross section of sunflower pith, the cells appear mostly hexagonal, Crystals are found in many of the cells, the most common form of the crystals here found being four edged pyramids. Crystals are to be distinguished by their smooth clear cut faces and sharp angles.

Pea starch appears as somewhat irregular though generally ellipsoidal with faint markings in concentric ellipses. The starch is given a blue color by mounting in iodine.

A longitudinal view of asparagus cells that have been kept for some time in alcohol shows them to be three or four times as long as broad and they contain protoplasm (a semifluid, semitransparent substance) which has been contracted by the alcohol. Within this protoplasm appears a sort of sac containing a darker substance. This sac is the nucleus and there are one or two thread like appendages at

tached to each end of it. Within the sac is a dark spot called the nucleolus.

PLATE I.

Fig. 1. a. Longitudinal section of the upper epidermis of a leaf of *Cypripedium insigne*. The walls are double. Three air bubbles are drawn in the figure. The cells number about 100 to the square millimeter. In this section they are mostly hexagonal. 1×350

Fig. 1. b. Longitudinal section of lower epidermis of a leaf of *Cypripedium insigne*. The cells are smaller and more irregular than those of the upper surface, though the opposite would appear from the figures (a. and c.) About 30 percent of the cells contain stomata. (1×80)

Fig. 1. c. a single stoma of the above section. The dark part shown within the stoma cell is the orifice. (1×350)

Fig. 2. Cross section of the upper epidermis of a leaf of *Cypripedium insigne*. a. Thick outer coat of epidermis smooth but slightly scalloped to conform to the cuticles of the arching ends of the adjacent cells. This outer coat is not a part of the cell wall and has little connection with the cell walls except at the points where the cells join. It is much thicker than the cell walls. The cells next the epidermis are quite regular; longer than broad and their longest directions being placed at right angles to the epidermis. They are nearly destitute of

chlorophyll. b. Thin places in the cell walls. There is a depression on opposite sides of the wall leaving but a thin membrane across the center of what would otherwise be a hole. c. Front view of one of these thin places. They are quite numerous as is shown by the number of front views drawn in these two cells. 1×350

Fig. 3 a. Vertical section, next to under surface of a leaf of *Cypripedium insigne* showing two stomata. The cells of the stomata should be more shallow than the ordinary cells next to the lower epidermis. 1×350 .

Fig. 3 b. Vertical cross section of a leaf of the *Cypripedium insigne* showing the comparative sizes and the arrangement of the cells of the upper and the lower epidermis and those of the interior. The part in checks not drawn marks the position of a fibrovascular bundle.

Fig. 4. Fibrovascular bundle as seen in cross section of leaf of *Cypripedium insigne*. General outline elliptical. The longest direction is at right angles to the surface of the leaf. The outer cells are angular and have thick translucent walls. These cells vary in each bundle from one to three rows. In the end of the section near the upper surface of the leaf are cells with thick opaque walls. These cells are generally round. The remainder of the interior of the bundle is filled with smaller angular thin walled cells. 1×180 .