to form pockets capable of holding water, and that if these pockets are filled with water the trichomes, both outside and inside, will be submerged.

Also in Tulips the tightly-folded sheathing base is covered on the inside with a large number of thin-walled hair-like trichomes. In fact, the resemblance to root-hairs was quite close. The leaf was adapted for guiding any water that might fall upon it directly to this region of trichomes. Here it seems possible, as also in the Bilbergias, that the plants may have developed, because of a change in the conditions under which they grow, these additional absorbing structures.

A series of experiments, however, failed to give conclusive proof of this function. Several innocuous liquid stains were placed and retained for hours, and even days, in these axillary pockets, after which sections were made of various parts of the stem. In a few instances the tissues were unmistakably stained. Oftener, however, no trace of absorbed stain could be found.

Yucca, a plant of arid regions, possibly also absorbs water through the base of the petiole, since we find on that part of the petiole which is wholly buried among the petioles of the surrounding leaves a large number of stomata.

These stomata may absorb water trickling into this region without at other times subjecting the plant to dessication, as they would if found on exposed parts of the leaf.

Now as to the root-hair area. Do we find in these plants whose leaves direct the water toward the main axis that the area of root-hairs is near the axis, and, on the other hand, that where the water is drained outward it will fall near the region of greatest root activity?

I believe we do in a very large majority of cases. There are plenty of exceptions, but I believe they are exceptions and not the rule As examples note all the grasses with fibrous roots, and many other Endogens growing from corms, bulbs, and rhizomes, from which grow out great masses of short, fibrous roots. On the other hand, note the forest trees, generally shedding the water outward and carrying the water toward if not to the root-hair area. But now I am not going to assert that the groove has been developed in order to direct the water inward, nor that the branches droop in order to carry it outward. On the contrary, if the root-hair areas are found as I have asserted, it is because these are the areas of greatest moisture, not that these have been made the areas of greatest moisture because the root-hairs existed there. The plant in sending out its roots seeks for moisture, and where that moisture and food is found in its most available form, it will develop root-hairs.

It does not seem then that the position of the root-hair area had any thing to do with the original formation of a grooved petiole, and I will again state that I believe the grooved petiole co-existent with and a necessity to the endogeneous type of vegetation.

THE CLEANSING FUNCTION OF HAIRS.

BY HENRY SEWELL, PH.D., M.D, DENVER, COLO

THE student of animal morphology is never so happy as in the discovery of a rudimentary organ or some structure which seems a worthless burden to its possessor; for, with an unacknowledged belief in a sort of teleology, he hopes by finding the origin of the useless appendage that the tangle of phylogeny may be loosened.

The student of animal physiology, on the other hand, is never more complacent than when to an apparently useless structure or unmeaning arrangement he can attribute some function by virtue of which the body is made a more efficient machine.

An interesting example of the subservience of form to function, which the writer has never seen mentioned, is found in the arrangement of the epidermic scales which form the outermost layer of animal hairs. The buried edges of the scales point towards the root of the hair, while the free edges project obliquely in the direction of the hair end, as the shingles on a roof point to the eaves. When a hair is drawn between the thumb and forefinger, which are gently pressed upon it, it will be found that the hair glides far more easily when pulled from root to tip than in the opposite direction. When the hair is simply rolled between the thumb and finger it will gradually move parallel to its length in the direction of the hair root. These results depend altogether on the way in which the hair-scales project from the hair axis. It is at once obvious that foreign particles clinging to the hair *in situ* would find easy the passage outward towards the tip and away from the surface of the body, but exceedingly difficult the progress in the opposite direction. Every movement of the hair, especially frictional disturbance, must set up a current of foreign particles towards the hair tip. The housewife has long known by experience how much more readily a vigorous shaking cleanses a woolen garment than one made of cotton.

The sebaceous glands opening at the mouth of the hair follicle, probably play an important part in surface cleansing; for their oily secretion sticks together the particles of shed epithelium, associated with all manner of filth, in such a manner that the "hair-rakes" can, no doubt, more easily remove them.

Ludwig long ago showed that, in the same way, the mucus secreted by the surface epithelium of the stomach and intestines agglutinates the detritus which covers the mucous membrane after digestion, and so makes possible its removal by the peristaltic action. The housewife, again, uses the same principle when she sprinkles a very dusty floor before sweeping, and finds the filth to roll before her broom.

One more reference to physiological body-cleaning: It has been found that the growth of epidermic epithelium proceeds in such a way, at least in certain situations, as to remove the worn-out cells *en masse*. Thus, on the external surface of the ear-drum, the direction of growth is such that the epithelial scales progress, pushed from below, steadily from the centre of the membrane and then along the meatus to the exterior. Foreign particles lying on the epidermis are of course carried with it.

NOTES AND NEWS.

THE first annual meeting of the Ohio Academy of Science was held at Columbus on Dec. 29-30. 1892. After some formal business, such as the appointment of committees, had been attended to, the reading of papers began. The following, among others, were read during the session: The Advantages of Arzama obliquata for Laboratory Instruction, D. S. Kellicott; The Inhabitants of a Species of Gall on Wheat Plants, F. M. Webster; Some Anticlines found in the Shales of Northeastern Ohio, Geo. H. Colton; Lantern Slides without a Negative, W. G. Tight; A Few Rare Ohio Plants, Aug. D. Selby; New Plants for the Flora of Ohio, W. C. Werner; Notes on the Distribution of Some Rare Plants in Ohio, W. C. Werner; Lichens of Ohio, E E Bogue; Leaf Variation: Its Extent and Significance, Mrs. W. A. Kellerman; Some Insect Migrants in Ohio, F. M. Webster; The Uredineæ of Ohio, Freda Detmers; Ohio Erysipheæ, Aug. D. Selby; The Development of the Berea Stone Industry, J. H. Smith; Snow-Rollers, W. S. Ford; Note on a Nest of White Ants, O. L. Sadler and Mrs. O. L. Sadler; The Histology of the Stem of Pontederia cordata L., E. M. Wilcox; Pulmonary Fistula in a Frog, J. B. Wright; Note on a Skull Pierced by a Stone Spear-Head, E. W. Claypole. In the evening the president, Dr. E. W. Claypole, delivered the annual address, taking for his subject "Devonian Ohio, or a Passage in the Making of the State." Premising that such an address should not be one intelligible only to geologists, as the majority were not specially devoted to that science, he outlined the geological history and growth of the region from the commencement of the deposition of the Corniferous Limestone to the base of the Berea Grit. The first part of the era was a time of profound peace, when a coral sea overlay all the State. This was followed by a time of depression, when the vast beds of shale were laid down. The fishes of that era, as preserved in these shales, came in for full consideration, and their immense bony plates were illustrated by numerous drawings. The leading genera were Titanichthys, Dinichthys, and Gorgonichthys. Mr. W. K. Moorehead was appointed a committee on archæology, especially with a view to the investigation of the antiquities of Ohio, and Professor G. F. Wright was made a committee on boulders.