

curio dealers search for them in a novel manner. This is done by sprinkling with water the pebbles on the beach of Little Traverse Bay. By the temporary polish thus produced, the dealers are enabled to gather the Petoskey stone in a nearly marketable condition for tourists.

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ANTIDROMIC PROBLEMS.

In my paper on Antidromy* I have tried to show: (1) that there is a diversity among the individuals of every species of flowering plants, some with a tendency to dextrorse, others to sinistrorse twisting; (2) that this can be traced more or less through the different orders of plants, in the seeds, stem, phyllotaxy, anthotaxy and seed vessels; (3) that it is apparently caused in most cases by the place of origin of the anules on the right or left margin of a carpellary leaf.

The general evidence for this view is to be found at large; and without going into details, I may say that further observations confirm the conclusions first reached. The article by Professor Beal in the *American Naturalist*, 1873, with interesting notes on two kinds of spirality in the cones of the same trees of the Coniferæ, presented a difficulty when first called to my notice; but I find that the young cones are homodromic with each other and with the leaf-spirals of the Coniferous trees, whilst the older cones undergo a change by displacement of the scales, resulting in a false antidromy in the same tree. On growing maize-plants from grains taken from one column of an ear, the forthcoming plants are of different kinds. (This is to correct the statement in my former paper.)

I have not yet been able to extend the law into the higher cryptogams; though some things in ferns make me hopeful of succeeding with them, as also some of the

illustrations in Schimper's *Vegetable Paleontology* and in other books. A few illustrations in the books are, I think, erroneous; thus Engler and Prantl give *Helicteres* (Sterculiaceæ) and with carpels *antidromic on the same plant*. I think this will be found erroneous, as I know the same work is wrong in the figure of *Erodium*, whose fruit-beaks are all and in all plants dextrorsely twisted (that is in the direction of the thread of a screw); as are those in *Pelargonium*. The carpels of these do not appear to be antidromic (though the leaves are so) as between different plants; and in *Impatiens*, of the same order, both carpels and leaves are antidromic. Sachs' *Botany* gives a figure with a wrong spiral for the elaters of *Equisetum* (and I confess my own sin here); they run dextrorsely in all the plants.

The spirals of the oogonium of *Chara* are always sinistrally twisted, given wrong in Dodel-port's diagram. The peristome of *Barbula* and other mosses, if twisted, is usually dextrorse, and the seta in opposite directions (didromic) in its upper and lower parts. I think the inner peristome of *Buxbaumia* is sinistrorse. The anchoring cable of *Vallisneria* is didromic, twisted dextrorsely above and sinistrorsely below, so as to bring the two ends nearer together by a central turning. The same is true of the awns of *Stipa*, *Danthonia*, and many other grasses; the base being a dextrally twined ribbon and the tip a sinistrorse seta; when it is wet the basal ribbon unwinds so as to screw the seta into the earth as into the wool of sheep or the clothing and skin of men, as Captain Cook's seamen discovered in the last century in northeastern Australia. These are cases not of true Antidromy, but of Didromy, a double twist in the same organ.

As mentioned in my former paper, *Richardia*, *Iris* and *Juncus* appear to produce antidromic plants not merely by seeds, but by

* *Torrey Bulletin*, September, 1895.

division of the rootstalk. A still more difficult case is the Bilsted (*Liquidambar styraciflua*). This tree can change its phyllotaxy with its branching; it may divide at the ground, sending up two stems, both of the same or of antidromic phyllotaxy; each stem may produce branches of both kinds, and the branches may bear secondary branches of their own or different spirality. Within any one branch, the phyllotaxy is definite, at $\frac{2}{5}$ divergence, one way or the other, for the bud scales of the annual innovations, as well as for all the leaves; and the order does not change within a branch, but between a branch and its sub-branches the order may or may not change. On the upper surface of the horizontal branches are the cork ridges which curve (irregularly) to right or left in harmony with the phyllotaxy of that branch.

The only explanation that occurs to me as possible is that Bilsted may have a latent tendency to produce both orders of phyllotaxy, that some slight inequality of nutriment may determine which shall start first, and that whichever gets the start is able to retain the preponderance for the particular branch, and the same influence is felt by the cortical growth. But the severe strictures of Sachs (*History of Botany*) on the old literature of phyllotaxy is a wholesome caution not to be speculating beyond the evidence; his criticism, however, is directed against theories invented by mathematicians, and not against those that would arise from a consideration of the plant's ontogeny.

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PRINCETON COLLEGE, October 25, 1895.

TYPHOID FEVER DISSEMINATED THROUGH THE MILK SUPPLY.

THE relation of milk to the spread of infectious diseases has been most strikingly shown in an epidemic of typhoid fever that occurred at Stamford, Conn., during this year, the official report of which has been

recently issued by Prof. H. E. Smith. The evidence gathered shows beyond all question that the disease was propagated by means of the milk supply, so that the epidemic possesses unusual interest for students in bacteriology and hygiene.

The epidemic broke out in April, and within six weeks 386 cases were reported in a town of about 16,000 inhabitants. Of this number, 65 cases or 16.8% were five years old or under, while over one-third of the total number were under ten years of age.

The mortality statistics of the State of Connecticut for the last 15 years show that less than 10% of the total number of deaths from typhoid have been under 10 years of age. In view of this, the large number of cases in early childhood has a peculiar significance in explaining the origin of the epidemic, as the infection of the milk supply would be more apt to manifest itself in infants than in adults. As soon as the milk supply was suspected, its sale was prohibited, and in fifteen days (about the usual period of incubation of this disease) after this prohibition went into effect the number of new cases dropped from an average of over ten a day to less than two. It was further shown that out of the total number of 386 cases, 352 or 91.2% lived in families that were supplied with milk from the same dealer. In 14 other cases milk from this same dealer was consumed by parties at a café and bakery. In 8 of the remaining cases milk was supplied the parties by the producer from whom the milk peddler obtained his supply. This makes a total of 97.1% of all cases that received the milk, either directly from the producer or indirectly through the milk dealer who peddled the milk. As the milkman in question only supplied about 9% of the total amount used in the town, the number of cases that developed on his route is of especial interest.

The evidence of a contaminated milk supply was overwhelming, but how to account