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II. On the Velocity of Sap

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II. *On the Velocity of Sap.* By W. R. M'NAB, M.D.,
Edinburgh.

If the amount of fluid transpired by a plant in a given time be measured, and if the size of the stem through which the fluid has passed be known, it becomes possible to calculate the velocity with which the fluid moved. As all the tissues in the stem do not serve as canals for the passage of sap, it becomes necessary to deduct the area occupied by the non-conducting tissues from the total area of the stem. Hales observed that a sun-flower transpired in twelve hours 34 cubic inches of water, the transverse section of the stem having an area of 1 square inch, a column of water 34 inches high would have passed through the stem if it had been a simple tube. Hales allowed one-third of the stem to be non-conducting tissue, which would thus raise the column to $45\frac{1}{3}$ inches. Calculating the velocity of the fluid from these data, we find that the rate was $\cdot 0011811$ inches per second, or still further reducing the conducting tissue, as Hales' calculation was too large, we have a velocity of $\cdot 0015748$ inches per second. Sachs ("Hofmeister Hand. der Phys. Botan.," vol. iv. p. 234) gives an account of an experiment on a branch of white poplar which transpired 480 cubic cent. of water in 110 hours. After making the necessary deductions for the non-conducting tissues in the stem, Sachs calculates the rate of movement to be $\cdot 064$ m.m., $\cdot 0025196$ inches per second. In experiments made by me to determine the velocity of the sap in the cherry laurel by means of lithium and thallium citrate and the spectro-scope, the following results were obtained :—

1.	$\cdot 0020232$	inches per second,	11 A.M., cloudy.
2.	$\cdot 0029436$	" "	3 P.M., cloudy.
3.	$\cdot 0035277$	" "	3 P.M., cloudy.
4.	$\cdot 0051108$	" "	11 A.M., bright sun.
5.	$\cdot 0078324$	" "	12 noon, bright sun.
Mean	$\cdot 0047292$	" "	" "

The mean of the five experiments giving a velocity of $\cdot 0047292$ inches per second. The greatest velocity, experiment 5, was obtained in bright sunlight at noon, the lowest

rates, experiments 1 and 2, were observed in the forenoon and afternoon, the sun being more or less obscured by passing clouds.

As Sachs has calculated the velocity on the amount transpired in 110 hours, the mean is lower than that obtained by spectroscopic observations. The short duration of the experiments, together with the time of day, increased temperature and brighter light, easily accounting for the difference. I am indebted to the Rev. J. Constable, M.A., Principal of the Royal Agricultural College, Cirencester, for some of the calculations required in this paper.

III. *Tendrils of Ampelopsis Veitchii.* By W. R. M'NAB, M.D., Edinburgh.

While visiting I. Anderson-Henry, Esq. of Hay Lodge, in August last, he directed my attention to the peculiar tendrils of *Ampelopsis Veitchii*. These tendrils are furnished with disc-like suckers—several of them occurring on one tendril and forming a very strong support. At first these appear as bodies resembling very much the head of a small pin, and afterwards they develop into flat discs. Sachs ("Lehrbuch der Botanik," p. 672) mentions, that in *Ampelopsis hederacea* the tendrils develop discs which secrete a sticky substance, and these adhere to walls, &c. Darwin found that the old dry discs would support a great weight—one tendril with five discs supporting no less than 10 lb.

The tendrils of *Ampelopsis* are like those of the vine—modified portions of the stem. They branch, and when examined in transverse section the ring of fibro-vascular bundles is seen to be complete. At the end of each of the branches of the tendril a slight club-shaped swelling is observed. This rapidly grows into a disc by the development of a large branching hair from every cell of the epidermis of the part of the club-shaped end of the tendril, which is next the body to be adhered to, and therefore that part which is most shaded from the light; as every cell produces a hair, the original epidermis is entirely lost. These hairs are glandular, and secrete a sticky substance which enables the disc to adhere to the wall or other support. The cells in the centre of the disc rapidly enlarge