account for all the diversity in their respective reactions. These results and considerations support Professor Vines' criticisms passed on Pringsheim's conclusions as to the seat of origin of the oxygen evolved during assimilation. Further discussion of the many points here raised would, however, be out of place within the limits of a note, but I hope to return to the subject at length on a future occasion.

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A NEW CASE OF POLYSTELY IN DICOTYLEDONS.—The stems of Angiosperms and the roots of vascular plants in general may be considered as exhibiting almost universally a monostelic structure. As regards the former, the only exceptions hitherto described are the Gunneras, and the Primulas of the section *Auricula*, which are polystelic, and the Nymphaeaceae with a few others, chiefly water-plants, which are astelic. In the case of roots, no exception was known until polystely was recently discovered in the adventitious roots of certain Palms, *Areca*, *Verschaffeltia*, &c., by Cormack¹.

While making a comparative examination of certain Nymphaeaceae, the results of which I hope to publish fully at a later time, I have found that in addition to astely, this remarkable order also presents cases of polystely.

In certain tropical and sub-tropical species of *Nymphaea*, the plants, at the end of each vegetative period, form numerous tubers as a means of surviving through the approaching dry season. Some, as *Nymphaea rubra*, *N. stellata*, &c., according to Raciborski², convert the whole of the lower part of the rhizome into a tuberous starch-laden structure coated with periderm. Others, as *N. flava* and *N. tuberosa*, examined by me, bear their tubers on lateral stalks of greater or less length. In *N. flava* they form very long stolons or runners (30–40 c. m. long), which are but slightly thickened at their terminations, where they bear below a large number of swollen starch-laden sausage-shaped roots, and above a number of buds protected by scale-leaves. These runners exhibit a truly polystelic arrangement of their vascular tissues, four to five groups of which are found running in the lacunar ground-tissue, each consisting of three to four vascular bundles grouped around a common centre where their xylems are confluent.

¹ In a paper read before the Linnean Society early this year.

² Raciborski, *Flora*, Band lxxviii, p. 262, 1894.

The well-formed and prominent phloem-groups are, on the other hand, completely separate from one another. The centre of each group, which thus constitutes a distinct stele, is occupied by an intercellular space formed by the disintegration of the older elements of the xylem, which, however, are still persistent towards each end of the runner. Around each stele runs a well-developed and easily demonstrated endodermis.

In *Nymphaea tuberosa* the stalks which bear the tubers are very short, not more than 4 c.m. long, some of the tubers being almost sessile. But all cases examined showed essentially the same structure as in *N. flava*, the stalk containing three to five separate steles, each composed of three to five vascular bundles, although here the separation of the bundles within each stele is much less distinct.

In all cases, whether the base only of the rhizome becomes tuberous (Raciborski, l. c.), or whether the tubers are borne on shorter or longer stalks, and even when the tubers are metamorphosed flower-buds, as in *Nymphaea Lotus* var. *monstrosa*¹, at the commencement of the next period of vegetation they bear buds, the first or first two internodes of which grow out into thin stolons and at their terminations swell out to form new rhizomes. In the cases of *N. flava* and *blanda*, these stolons, which may be termed secondary, arise from the buds previously mentioned in reference to the former species, as springing from the ends of the primary runners. They possess six to seven vascular bundles, the arrangement of which differs from one stolon to another, and even in the different regions of the same stolon. For they may be all separate and distinct, or a varying number of them may unite in pairs. When there are only six present, and these unite into three pairs, such sections present a striking similarity to those of the floral peduncle of *Cabomba aquatica*, for here also there are six bundles of a very similar appearance and united into three pairs. The rhizome and floating shoots of *Cabomba* possess two such pairs only.

These facts seem to introduce a question as to whether the term 'stele' should be applied to these paired bundles or not, for in the former case we should have to consider *Cabomba*, and also *Brasenia*, which is exactly like it, as polystelic plants throughout, excepting their petioles. At any rate, we have here in the single order Nymphaeaceae all gradations from the undoubted distinct steles found in the primary

¹ Barber, Ann. Bot., Vol. iv, p. 105.

stolon of *Nymphaea flava*, which contain five, four, or as few as three bundles each, to those with two bundles in the secondary stolons of the same plant and of *N. blanda*, and also in the stem and floral peduncles of *Cabomba*. Indeed, in the secondary stolons of *N. flava* and *N. blanda* the two bundles of any pair may in their course fuse completely together and become a single bundle comparable to a bundle in the stem of *Nelumbium nuciferum*.

We see then that in this order a complete series of transitions can be traced from typical polystely to the well-known astelic condition.

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DEMONSTRATION OF ROOT-PRESSURE AND TRANSPIRATION.—I have found that root-pressure may be conveniently demonstrated and measured by means of an ordinary Bourdon's pressure-gauge. To give an instance:—a few weeks ago, one of these instruments, connected with a branch of a Vine growing in the open, gave readings up to a maximum pressure of 10 lbs. to the square inch. I am arranging to have an instrument of this kind made with a special view to this purpose, provided with an adaptation for obtaining a graphic tracing on a revolving drum, and I am inclined to think that it may be possible by this means to obtain more accurate knowledge than we at present possess on such points as the daily period of the root-pressure and the influence upon it of variations in the external conditions.

With regard, now, to transpiration, the recent researches of Dixon and Joly¹, and of Askenasy², seem to make the determination of the suction-force of a transpiring plant a point of great importance. Boehm³ succeeded in causing a transpiring branch to raise a column of mercury 900 m.m.—that is, the branch exerted a suction-force of about 140 m.m.—and that is all the information that we possess at present in the way of measurement of the force which is now regarded as the efficient cause of the transpiration-current.

A year ago I attempted to make some measurements of this force

¹ Dixon and Joly: On the Ascent of Sap; Annals of Botany, Vol. viii, 1894; Proc. Roy. Soc., Vol. lvii, 1895; Phil. Trans. 1895.

² Askenasy: Ueber das Saftsteigen; Verhandl. d. Naturhist.-med. Vereins zu Heidelberg, Neue Folge, Bd. v, 1895 and 1896.

³ Boehm: Ber. d. deut. bot. Ges. 1893.

Gwynne-Vaughan, D. T. 1896. "A new case of polystely in dicotyledons."
Annals of botany 10, 289–291.

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