available for computing the carbon dioxide evolved. Corrections for volume should be made on account of the changes in the bulbs; otherwise the calculations are exactly similar to those for the method hitherto used with the Krogh manometer.

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THE PHYLLOTAX—A PRACTICAL APPARATUS FOR DEMONSTRATING DIVERGENCE

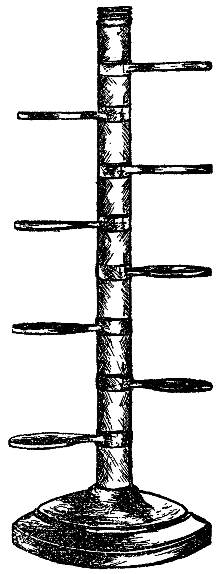
TEACHERS of botany have often found it difficult, if not impossible, to obtain adequate plant specimens for the purpose of properly illustrating their lectures on divergence. Even when such plant specimens are available, the fact remains that quite a number may be required to illustrate the main types of divergence.

I devised a few years ago an apparatus which, I think, will prove of some use. It consists of a metal stem along which are placed, at regular intervals, a number of leaves, each one being attached to a ring revolving about this stem, in order to give any desired divergence. If the divergence $\frac{1}{2}$ is wanted, two leaves should be met at regular intervals before the observer returns over the starting-point. Let us take a less simple case, for example the divergence $\frac{2}{5}$, which requires two complete revolutions around the stem before a leaf is found above the starting-point: there should then be five leaves, each forming with the next an angle of 144°.

All divergences have a value ranging from $\frac{1}{5}$ to $\frac{1}{2}$. The most common ranges are from $\frac{1}{3}$ to $\frac{2}{5}$, and are known as the "normal series." In illustrating divergence, it is of course more suitable to use the simplest cases, *i.e.*, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{2}{5}$. Such divergence as $\frac{3}{7}$ or $\frac{3}{8}$ can not be illustrated in a lecture. It might be convenient to indicate on the apparatus Fibonacci's angle: 137° 30′ 28″. This angle is the limit towards which the different values of the normal series converge, but it should never be considered as a type of divergence in itself.

DESCRIPTION OF THE APPARATUS

A metallic stem is vertically fixed on a stand. On the stem are placed, as stated before, equidistant revolving rings, each bearing a leaf. Every one of the rings has inscribed on it the fractions denoting divergence. It will be easily understood that the relative position of the fractions differs from one ring to the other. One would naturally expect to find these fractions on the fixed axis of the stem, *i.e.*, between the rings; setting every leaf to a predetermined fraction would give the divergence wanted. But this process has its drawbacks since, for instance, to get the divergence needed, we have to revolve the whole apparatus to find the figures. On the other hand, if the fractions are on the revolving rings and the stopping points for each leaf along the same vertical of the fixed axis of the apparatus, the observer will have only to face the stopping points and to move each leaf until the fractions for a given divergence are all set on the said stopping line.



HOW THE FRACTIONS ARE PLACED ON THE DIFFERENT REVOLVING RINGS

The first ring, whether at the top or at the bottom, will always remain in the same position for all demonstrations of divergence. On this first ring, it is not the leaf that is brought to the stopping mark, but a chosen point which is found on the ring 45° from the leaf. This prevents any fraction from occurring on the succeeding rings at the point of attachment of the leaves. Otherwise rather broad rings would be required for easy reading of fractions on account of the leaf at that point. The positions of all fractions on the other rings depend on the position of the mark on the first ring. The fraction $\frac{1}{2}$ on the second ring will be found 180° away from the mark of the first leaf, *i.e.*, 225° from the point of attachment. The fraction $\frac{1}{3}$ on this same ring will be 120° apart, instead of 180°, *i.e.*, 165° from the leaf. On the third ring the fraction $\frac{1}{2}$ will be 180° away from its position on the second ring and this will bring the third leaf to the original position of the first one. On this third ring the fraction $\frac{1}{3}$ will be 120° away from its position on the second ring, *i.e.*, 285° from the leaf. And so on.

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SPECIAL ARTICLES

ONCHOCERCIASIS IN GUATEMALA

THE Harvard Expedition for the investigation of onchocerciasis in Guatemala has been working in that country since January 27. The disease in Guatemala is characterized by the formation of nodular tumors situated on or in the region of the head. The fibromatous tumors are of parasitic origin, and the adult male and female *Onchocerca coecutiens* are situated