all the instruction in the college is given in this language.

To give an idea of the varied contents of the journal, I list as follows some of the titles of articles that appear in Nos. 1 and 2 of Volume 9: Lefever, Rufus H., "Summer Birds of Hongkong"; Takahashi, R., "Notes on Some Chinese Aphididae"; Tai, F. L., "Studies in Gymnosporangia on Juniperus Chinensis —I. Gymnosporangium Yamadae Miyabe"; Merrill, E. D., "A Third Supplementary List of Hainan Plants"; Werner, F., "Rana Leporipes, a New Species of Frog from South China, with Field Notes by R. Mell"; Wu, K., "A Study of the Common Rat and Its Parasites"; Frank, Henry S., "The Le Chatelier-Braun Principle. I. A Thermodynamic Proof"; Wu Ma Na, "The Solubility of Sodium Chloride in Saturated Solutions of Sodium Chlorate"; Fenzel, G., "Problems of Reforestation in Kwangtung with Respect to the Climate."

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MODIFICATION OF KROGH'S DIFFERENTIAL MANOMETER

IN 1929 Meyerhof and Schmitt[1] published an account of an investigation conducted by them on the respiratory quotients of nerves at rest and in activity, in the course of which they described a manometric method of determining in one operation the consumption of oxygen and the output of carbon dioxide. A solution of barium hydroxide and one of citric acid were kept separately in receptacles in the lower part of a bulb designed on the principle of one contructed by Warburg,[2] who used it for a different purpose. These investigators used three types of the bulb, differing in minor details. Carbon dioxide was absorbed by the barium hydroxide, and the consumption of oxygen was determined. Then the carbon dioxide was liberated by the addition of the citric acid to the barium carbonate formed. This procedure furnishes a convenient, rapid method for estimating the respiratory quotient.

The writer has found that this method can be used with a Krogh manometer,[3] after that instrument has been slightly modified by indenting the bottom of each of its bulbs to form two separate depressions for the reception of about one cc of solution in each. Bulbs of this type can be made by any glass blower. The partition between the two depressions should be made entirely across the bottom, and reach upward to about the center, of the bulb, as shown in Fig. 1.

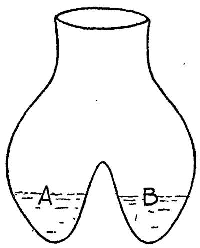

FIG. 1

Into A, Fig. 1, about 0.4 cc of a 5 per cent. solution of barium hydroxide is accurately measured, and into B the same quantity of a 15 per cent. solution of citric acid; in this bulb, let us suppose, is suspended the insect or other object under investigation. Into the compensating bulb, of the same construction, are measured the same quantities of these solutions, not for any chemical reaction, but to equalize the available air spaces in the two branches of the manometer. While the two solutions in the insect-containing bulb remain separate the barium hydroxide there absorbs the carbon dioxide given off by the insect, thus changing the position of the liquid, at first in equilibrium, in the two legs of the manometer. Suitable readings (on the attached scale) for the positions of the liquid, together with the known constants of the instrument, afford data for computing the oxygen consumption.

After these readings have been made the manometer is carefully raised from the water-bath in which, for suitable and uniform temperature, the bulbs have been immersed, and the two solutions in the insect-containing bulb are quickly mixed by gentle agitation until the mixture becomes clear, the stopcock remaining closed. The bulbs are then replaced in the water-bath. By very careful manipulation the mixing of the two solutions may be accomplished without removing the bulbs from the water bath, but apparently this precaution is of no advantage. The citric acid liberates the carbon dioxide from the barium carbonate formed during the insect's consumption of oxygen, thus producing a movement, in the opposite direction, of the manometer fluid, which immediately reaches a constant level. Readings are then made for the new position of the manometer fluid, after which all needed data are

[1] O. Meyerhof, and F. O. Schmitt. "Über den respiratorischen Quotienten des Nerven bei Ruhe und Tätigkeit," *Biochem. Ztschr*, 208: 445–455. 1929.

[2] O. Warburg. "Methode zur Bestimmung von Kupfer und Eisen und über den Kupfergehalt des Blutserums," *Biochem. Ztschr*, 187: 255–271. 1927.

[3] A.Krogh. "Ein Mikrorespirationsapparat und einige damit ausgeführte Versuche über die Temperatur-Stoffwechselkurve von Insektenpuppen," *Biochem. Ztschr*, 62: 266–279. 1914.

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

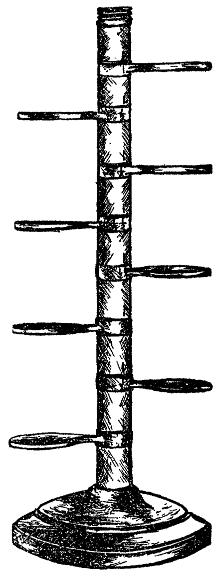
TEACHERS of botany have often found it difficult, if not impossible, to obtain adequate plant specimens for the purpose of properly illustrating their lectures on divergence. Even when such plant specimens are available, the fact remains that quite a number may be required to illustrate the main types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