side but maintaining communication of main body of apparatus with funnel F through rubber tube C. Now stopcock H (immersed under water) is opened, allowing solution of hydrogen peroxide to flow from funnel F into compartment A. This compartment has the capacity of 100 cc; with 95 cc of liquid introduced there remains a 5 cc "air bubble" facilitating agitation. The whole apparatus is given a gentle shake or two and the time noted. Readings are made in millimeters on manometer K at intervals of one minute for five minutes.

If activity of the tissue is so great as to bring about a maximum reading in less than five minutes, amount of material is reduced to 10 grams or even to 1 gram. We have worked in this laboratory with materials which in amounts of .2 gram bring about a maximum excursion in less than five minutes.

To express the activity in terms of units generally acceptable we adopted the following definition: A unit of catalase activity will cause liberation in five minutes of 1 microgram (.000001 g) of oxygen per gram of tissue. We have prepared a table which enables the experimenter to quickly convert manometric readings into catalase units. This tabulation requires too much space to be given in this note. Copies of the table will be mailed by the author on request. The apparatus and accessories can be secured from The Emil Greiner Company, 55 VanDam Street, New York City.

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MEASURING SLIDE FOR CLASS USE

THE ruled millimeter slide intended for use in low power dissecting microscopes, while indispensable for serious accurate work, is somewhat costly when considered for class use involving a quantity of slides. This, coupled with the liability of breakage in inexperienced hands, makes the use of the white celluloid metric rule the common measuring instrument in most elementary classes of taxonomy. The author has found an efficient substitute that can be made with ordinary photographic materials.

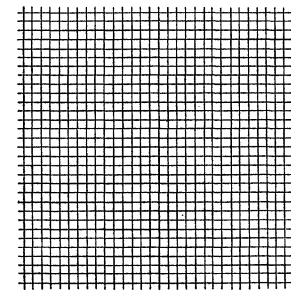

FIG. 1. Scale as it appears on finished slide.

A piece of paper is ruled with cross lines at 3-mm intervals to form a cross-ruled block 9 cm square. This is photographed on a process plate to produce an image of exactly one third the size of the original. This can be readily gauged on the ground glass with a pair of dividers set at an opening of 3 cm. The negative should be developed in a suitable contrast developer having sufficient potassium bromide to keep the lines absolutely clear while allowing the rest of the plate to become as dense as possible.

This negative printed on a slow lantern slide plate will produce a scale sufficiently accurate for any class work involving the measurement of small floral parts, seeds and fruits. A thin cover-glass bound on the slide will protect the surface from scratches. Students find scale drawings of floral parts easily made by lightly ruling with pencil their paper into squares of 5, 10, 20 millimeters or more in size and making their figures by direct comparison.

With the ordinary low magnifications used in classes of taxonomy, the essentially granular nature of the emulsion on the plate is of no serious consequence. The chief point in favor of this process is the cheapness of the slides thus produced, which in supplying a class of 20 or 30 students becomes of considerable importance.

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SPECIAL ARTICLES

THE RELATIONSHIP IN THE HEN BETWEEN THE DEVELOPMENT OF OVA, BLOOD CALCIUM AND THE ANTIRACHITIC FACTOR

OBSERVATIONS were made of the number of ova larger than 1 cm in diameter and of the blood calcium level of 30 pullets in June, 1929, which was toward the close of their first year of laying. They had been maintained for 8 months on a ration deficient in the antirachitic factor but which was supplemented, in the case of some individuals, with this factor in the form of cod-liver oil, irradiated ergosterol or sunlight through an ultraviolet-transmitting material, Cel-O-Glass.

Regardless of whether or not the antirachitic factor had been supplied, the presence of ova greater than 1 cm in diameter was accompanied by a blood calcium level between 13.0 mg and 26.7 mg per 100 cc of serum. The diameter of 1 cm was selected arbitrarily as the dividing line between developing or mature ova

and those which either had not developed or had just started to develop. When no ova greater than 1 cm in diameter were observed the blood calcium level was between 13.0 mg and 7.5 mg. Eight of the group of 30 pullets had been deprived of the antirachitic factor for a period of 8 months before killing and consequently were not actively producing eggs, although they had not started to molt. In spite of this deprivation, the presence of large ova was accompanied by a blood calcium level greater than 13.0 mg.

Ten pullets were maintained on the same basal ration for a period of four months longer; these were of the large group of which 30 had been killed and they had received their antirachitic factor throughout the eight-months laying period in the form of irradiated ergosterol, in an amount biologically equivalent to 10 times the 2 per cent. of cod-liver oil which is frequently used in poultry rations. During July and August the amount of irradiated ergosterol was doubled, but this did not stop the waning egg production associated with molting. Early in September, the feeding of 2 per cent. of cod-liver oil was begun in place of the ergosterol and continued until the end of the experiment. Observations of the ova and blood calcium of the 10 individuals were made early in the month of October when the birds were in a molting condition. Nine had no ova larger than 1 cm in diameter, and their blood calcium was 13.7 mg or below. One individual showed a blood calcium of 16.0 mg and 4 large ova were observed.

On November 5, 1929, five hens in a molting condition, but which had been exposed to all the sunlight available each day for a period of 6 weeks, were killed for observation. No ova greater than 1 cm in diameter were noted, and the blood calcium level was below 13.0 mg except in one case in which a value of 13.5 mg was obtained. Although an adequate amount of the antirachitic factor had been supplied to these individuals a high blood calcium did not prevail and ova greater than 1 cm in diameter were not present. In an earlier preliminary experiment (unpublished data) it was found that the feeding of daily doses of irradiated ergosterol to hens not in a molt, but which were not in active egg production because of a deprivation of the antirachitic factor, caused active production to take place.

The data show that the presence of large ova and high blood calcium does not always indicate active egg production, and suggest that the antirachitic factor may not be necessary in the development of ova, at least, it may not be the essential factor involved in the development, and that the antirachitic factor may not be the sole factor in causing high blood calcium.

Although a biological test, the use of the white rat, indicated that the basal ration was devoid of the antirachitic factor, it is realized that traces of this factor may have been present in the ration which permitted only a slow development of ova and occasional production of an egg.

Riddle and Reinhart[1] have shown that high blood calcium prevails in female pigeons at each ovulation period, and Hughes, Titus and Smits[2] report that high calcium prevails in hens which are in production, and low calcium in those which are molting. Our results confirm those of the above investigators with the exception that high blood calcium is not always associated with active egg production. Recently, Buckner, Martin and Hull[3] reported high calcium values for actively producing hens and for those not in active production, whereas molting hens showed a low value. Our records also confirm this report.

Whether the development of ova caused the blood calcium to rise or whether an increase in blood calcium stimulated ova formation will have to be investigated further, but it should be noted that high blood calcium was never found unless developed or developing ova were present.

It is of interest to note that Hess, Bills, Weinstock and Rivkin[4] found the blood calcium of the cod to be high at the spawning season although the eggs are without shells. In the case of the hen the presence of ova, although eggs with shells were not being produced frequently, was accompanied by a high calcium level.

Observations of 49 hens and pullets in June of this year have confirmed our previous results, and an extended report of this investigation is being prepared for publication.

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THE QUANTITATIVE DETERMINATION OF BACTERIOPHAGE

IN a recent paper[1] the writer described a comparative method for the quantitative determination of bac-

[1] O. Riddle and W. H. Reinhart, *Am. J. Physiol.*, 76: 660, 1926.

[2] J. S. Hughes, R. W. Titus and B. L. Smits, SCIENCE, 65: 264, 1927.

[3] G. D. Buckner, J. H. Martin and F. E. Hull, *Am. J. Physiol.*, 93: 86, 1930.

[4] A. F. Hess, C. E. Bills, M. Weinstock and H. Rivkin, *Proc. Soc. Exp. Biol. and Med.*, 25: 349, 1928.

[1] A. P. Krueger, "A Method for the Quantitative Determination of Bacteriophage," *Jour. Gen. Physiol.*, 1930, 13: 557–564.