and rat bone-marrow smears showed essentially the same reaction even after 16–18 hrs of incubation. The reaction was found exclusively in the nucleus of chicken red blood cells. This is in accordance with Dounce and Seibel's work (*2*).

A more detailed account will be published in the future.

References

1. ABUL-FADL, M. A. M., and KING, E. J. *Biochem. J.*, 1947, **41**, xxxii (Proc.).
2. DOUNCE, A. L., and SEIBEL, D. *Proc. Soc. exp. Biol. Med.*, 1943, **54**, 22–24.
3. GOMORI, G. *Arch. Path.*, 1941, **32**, 189–199.
4. MONTAGNA, W., and NOBACK, C. R. *Science*, 1947, **106**, 19.

IN THE LABORATORY

A Simple Tangent Meter

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One is in frequent need of an instrument for the determination of the angle which a tangent to a curve at a given point will make with the coordinate axis. Apparently there is no instrument designed for this purpose on the market.

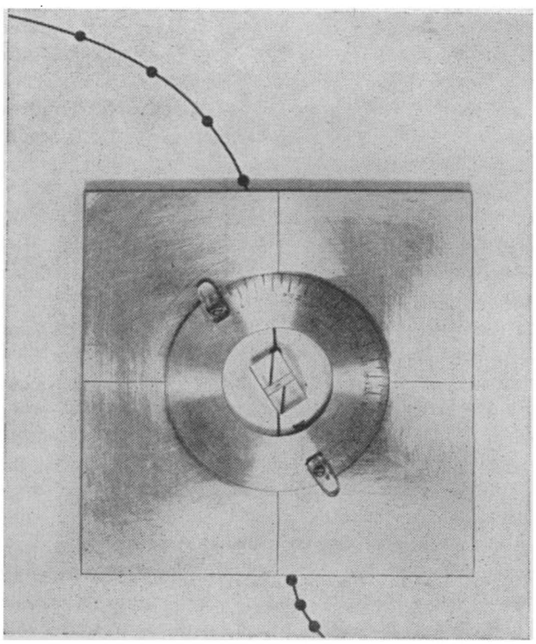

FIG. 1

The simple instrument shown in Fig. 1 has been found useful in determining the slopes of curves at particular points. This tangent meter is not as simple in construction as the one described by Latshaw (*1*), but it does have the advantage of permitting one to read the tangent angle directly. In the measurement of the angle the instrument is placed over the curve with the center of the prism directly over the point of interest, and, with the help of a T-square, it is held firmly in place with the edges of the meter parallel to the coordinate axis. The ring is then rotated by means of the two knobs until the lines in the prism intersect to give a continuous line. The angle is then read from the scale.

The drawing shown in Fig. 2 is to scale. The instrument was built from ⅜″ aluminum plate, and the window upon which the prism is placed is of Lucite, which was pressed into the ring. The triangular prism is glued to

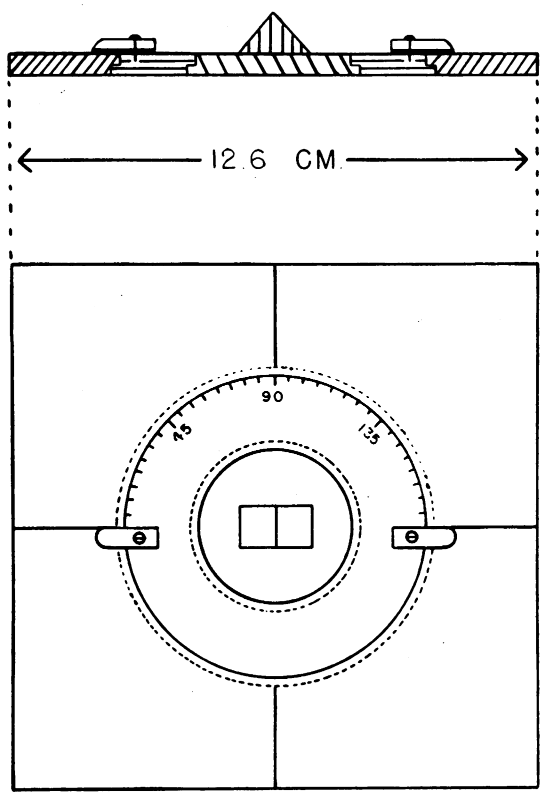

FIG. 2

the Lucite with Canada balsam, and the prism is centered so that the hairlines on the rectangular plate intersect in the center of the prism. When the curve is drawn on coordinate paper, the hairlines are of considerable help in centering the tangent meter.

This simple device may be modified in several particulars. Figures for the angle could be placed on the stationary block with a pointer on the ring; it might also be advantageous to put the tangents of the angles on the block so that the slopes could be determined directly.

Reference

1. LATSHAW, MAX. *J. Amer. chem. Soc.*, 1925, **19**, 793.

Slide Rule Calculations of Radioactive Decay[1]

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The decay of a radioactive substance is described by the equation

$$N = N_0 e^{-\lambda t},$$

in which N is the number of particles remaining at the time, t; N_0, the initial number of particles; and λ, the decay constant, or fraction of the number present disintegrating per unit time. The time may be expressed in any desired units if the corresponding reciprocal unit is understood for the decay constant. An alternative form of the equation is

$$N = N_0 \cdot 10^{-\lambda' t},$$

in which $\lambda' = 0.4343\lambda$. The time interval, $T_{\frac{1}{2}}$, during which the activity decreases to half of its original value is called the half-life. Since $\lambda T_{\frac{1}{2}} = 0.69315$ and $\lambda' T_{\frac{1}{2}} = 0.30103$, any of the three quantities $T_{\frac{1}{2}}$, λ, and λ' may be used to characterize a particular radioactive species.

Calculations involving this equation may be carried out to any desired precision with the aid of tables of logarithms. For a material of known half-life which is used frequently, it is convenient to prepare a logarithmic plot of activity against time on a linear scale. The decay curve is a straight line passing through the points $N/N_0 = 1$ at $t = 0$ and $N/N_0 = 0.5$ at $t = T_{\frac{1}{2}}$. If the precision of values obtainable from the chart is inadequate, a table may be computed showing the fraction remaining at convenient time intervals.

The purpose of this note is to call attention to the ease with which decay calculations may be made with an ordinary slide rule. For example, to find N/N_0, the fraction of a preparation of a given half-life remaining after time t, one may proceed as follows: Use the rule in the usual way to divide 0.301 by the half-life and multiply by the time, to obtain $\lambda' t$. Set the mantissa of this logarithm on the L-scale opposite the index of the C-scale (or D-scale, depending on the style of rule) and read N/N_0 on the C-scale (or D-scale) opposite the index of the L-scale. If $\lambda' t$ is greater than 1 (*i.e.* $t > 3.32\ T_{\frac{1}{2}}$), the characteristic is greater than zero, and the reading on the C-scale (or D-scale) is divided by the power of 10 called for by the characteristic. Note that it is necessary to remember only the half-life and the common logarithm of 2, namely, 0.301. The precision depends on the dimensions of the slide rule; *i.e.* three significant figures are obtained with a 10″ rule.

On a log-log rule, a single setting of the slide serves to obtain the fraction remaining as a function of time. Simply set the half-life on the B-scale opposite 0.5 on the LLOO-scale, then read off N/N_0 on the LLOO-scale opposite any desired t on the B-scale. With the same setting, the LLO-scale gives values of N/N_0 for values of time equal to 0.01 of those read on the B-scale. Since the B-scale has two halves, care must be used to interpret the position of the decimal point consistent with that implied in the half-life setting. In this case, the fraction remaining after a time which is short in comparison with the half-life can be read on the LLO-scale to a surprising number of significant figures. For long time intervals, the first method gives better precision.

The reader will recognize that other types of problems involving a radioactive emitter with a single-valued half-life can be handled with the slide rule by methods similar to those illustrated in the examples given above.

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Faster Sharpening of Microtome Knives by the Use of Alumina-Dreft Suspension

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It has been found that microtome knives are sharpened very quickly and effectively on a Fanz microtome knife sharpener by using a grinding compound composed of the following: Alumina[1] #8, 5 gm; Alumina #9, 3 gm; Dreft,[2] 5 gm; and distilled water, 200 cc. (The amounts are approximations.)

In the sharpening procedure about 20 cc of well-shaken Alumina-Dreft suspension is poured on the glass plate of the knife sharpener at the beginning and replenished as needed. It has been found that it is best to make up a fresh suspension before each grinding session, and an absolutely smooth glass plate is important.

For a simple touching up of the blade edge, about 2 min on each side, followed by several few-second periods on each side, will be all that is necessary to give a fine, straight, polished edge.

If the edge is badly nicked, correspondingly longer time will be required to obtain a suitable cutting edge. In this case, a total time of about 30 min (depending on the hardness of the knife steel) may be required, alternating sides at approximately 5-min intervals and checking the edge frequently under the medium-power objective of a microscope. The edge should be finished as described in the preceding paragraph.

[1] Linde Alumina, Arthur H. Thomas Company, Philadelphia.

[2] Manufactured by Procter and Gamble; available at the corner grocery.