area. No other parts of the protozoan reacted to the test by any color production.

Chaos diffluens showed[4] a coarse granular area in the nucleus, which gave a vivid purple color, with the remainder of the nucleus clearly colorless. This irregular central mass of chromatin, which may also be distinguished in Giemsa preparations, varied in size and shape. Frequently it occupied a relatively small area of the nucleus and stretched out lengthwise in the shape of a "w", and at other times appeared as a large irregular mass. We may judge from this that the thymonucleic acid of this nucleus is segregated into one mass of the nuclear material. All of the usually so-called chromatic material of the nucleus does not give a positive reaction therefore.

The food vacuoles of *Chaos diffluens* gave a faint violet reaction as did those of Paramecium, due doubtless to the ingested bacteria. An instance of cannibalism was observed, where a large individual of Chaos had completely ingested a Paramecium. The Paramecium nucleus gave the characteristic brilliant purple color reaction.

A multinucleate Opalina from the rectum of the frog also indicated a regional arrangement within each nucleus of the chromatic material which gave a purple color. No color appeared elsewhere in the protozoan. Several large brilliant purple masses appeared in peripheral distribution within each nucleus. The remainder of each nucleus was quite faint or entirely negative in reaction.

These data suggest the value of the Feulgen thymonucleic acid reaction applied to the protozoa.

4711

Condenser Technique for Measuring Glass Cell or Other Potentials in Circuits of High Resistance.

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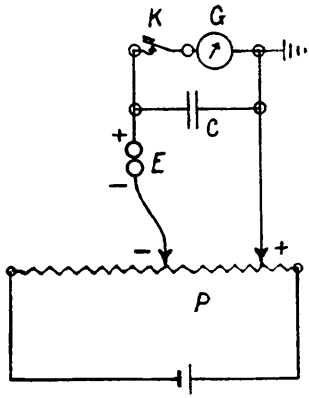
Glass cell potentials or other electrode potentials in series with high resistance can be measured conveniently by a modification of Beans and Oaks'[1] condenser technique. Instead of the simple ballistic method employed by them, the cell is compensated by a potentio-

[4] Schaeffer, A. A., *Carnegie Inst. Publ.*, 345, 1926, xxiv.

[1] Beans, H. T., and Oaks, E. T., *J. Am. Chem. Soc.*, 1920, xlii, 2116.



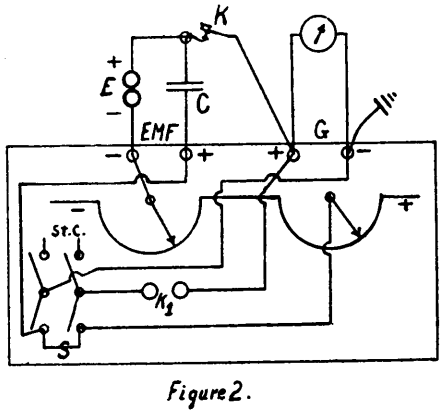


FIG. 1.

Glass-cell potentials determined by the aid of a condenser. The uncompensated difference of potential between the potentiometer *P* and cell *E* slowly charges the condenser *C*, which is then suddenly discharged through *K-G*. The potentiometer is now readjusted until a null point is indicated.

FIG. 2.

Adaptation of the Leeds and Northrup Type K potentiometer to the scheme of Fig. 1. See text.

meter, and a null point reading made, thereby reducing polarization of the cell by reducing the charge on the condenser (Fig. 1).

The Leeds & Northrup type K potentiometer lends itself readily to such an arrangement. Glass cell and condenser are connected in series to the regular E.M.F. binding posts (Fig. 2). From a point between glass cell and condenser a lead passes to the insulated lower contact of the key *K* and from the upper contact to the galvanometer binding post proximal to the E.M.F. posts. The double point, double throw switch of the potentiometer is short-circuited across its front posts, at *S*, and the potentiometer may still be checked against the standard cell in the usual manner without complication. The potentiometer tap keys with resistance protection (K_1) are employed as usual in reading the standard cell check, and the extra tap key *K* only is used in reading the glass cell-potentiometer balance, the condenser acting as a protection to the galvanometer.

A 2 m.f. condenser is sufficient to give a reading to 0.2 millivolt on a Leeds & Northrup high sensitivity galvanometer (10^{-10} amp./mm.) critically damped by a shunt. With a glass cell of 150 megohms resistance, the time of charge to 1/2 final voltage of the condenser through this resistance is 3.5 minutes, the time to 90% is 12 minutes. Adjustment to within one millivolt of the null point can be made by readings at intervals of only a few seconds, since the condenser need be charged to only a small fraction of its full capac-

ity to obtain this sensitivity. The system is grounded at the galvanometer and requires no shielding; careful insulation is required only for the glass cell itself, the condenser and the lower key contact. These are mounted on paraffin. 2 mf. by-pass condensers from radio stocks can be selected, which have a resistance to direct current of over 10^{11} ohms, or over one thousand times that of average glass cells.

This arrangement is also satisfactory for reading micro-electrodes or potentials in any high-resistance circuit, the value of the condenser being chosen to give the required sensitivity.

4712

Plasma Protein, Erythrocyte Sedimentation and Serum Lability in Tuberculous Individuals.

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Sedimentation of the corpuscles of heparinized blood was determined by noting the extent of fall in glass tubes with an inside diameter of 4 mm. and height of 100 mm. during an interval of 1 hour. The tubes were centrifuged to insure complete sedimentation and the sedimentation-index computed as the ratio between the sedimentation observed in 1 hour and the possible maximum extent of sedimentation.

Precipitability of serum protein was determined by adding various amounts of aluminum sulphate, as contained in a unit volume of 1 cc. to 0.2 cc. of unheated blood serum in small tubes. Serum and reagent were mixed and set aside at room temperature for 1½ hours. A heavy flocculent precipitate that settled out leaving a clear supernatant fluid was recorded as a positive reaction.

Average values for these blood properties as observed in a group of 14 tuberculous and a group of 20 normal individuals are listed in the accompanying table with average values for total protein, fibrin, globulin and albumin as contained in the plasma.

In the presence of tuberculous infection the blood of man exhibits a quantitative shift in plasma protein toward the more labile globulin and fibrinogen fractions, also an increased sedimentability of the corpuscles and an increased precipitability of serum protein. The latter changes are coincident with but not necessarily related to changes in plasma protein. Apparently with the inception of a