and committee; at the Royal College of Physicians, by Lord Dawson, of Penn, and Lady Dawson, and the one by Dr. and Mrs. Singer, as already mentioned. On Friday evening a banquet was held at which various delegates spoke.

DAVID EUGENE SMITH

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A TRIPLE-SPECTRUM DISCHARGE TUBE

THE mercury-vapor lamp is probably the most generally useful light source for spectroscopic, optic and general instruction laboratories. Many times, however, the supply of lamps is not equal to the demand, and the availability of inexpensive substitutes is very desirable. For this reason the possibilities of the electrodeless discharge were investigated, and it was thought that the results obtained might be of general interest.

A pyrex glass tube A about 20 cm long and 4 cm in diameter was provided with a side tube B and a "sucked-in" thin glass end C.[1] Ten grams each of zinc, cadmium and mercury were placed in the tube. The tube was placed in an oven and baked at 450° C. for several hours, while the gases in the tube were removed by a mercury diffusion pump. During the baking-out process the mercury was kept in B, which was arranged to be out of the oven. Just before the tube was sealed off at D, the mercury was distilled from B to A.

The completed tube was mounted in an asbestos box equipped with two "Glo-coils" as shown in the figure.

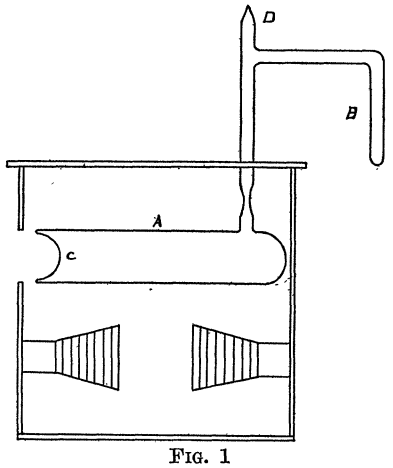

FIG. 1

A helix of 8 turns of No. 8 copper wire was placed around A. The helix was connected in series with a variable spark gap and the secondary of a 1 K.V.A. Thordarson transformer. Three Leyden jars were connected in parallel with the helix. The variable spark gap, which was enclosed in a sound-proof box, is essential to obtain a discharge which fills the entire tube. In order to prevent the mercury from depositing on C while the tube is in operation, the helix should extend well to the end of the tube. Best results are obtained if large-sized wire is used for all electrical connections.

Three quite distinct types of discharge may be obtained with this tube.

(1) If all the mercury is left in A and the tube slightly warmed, a discharge quite comparable in intensity to ordinary mercury arcs results. Mercury and zinc lines are prominent. In the present case the thin glass window transmitted with great intensity ultra-violet radiation to 2,536 Ang.

(2) By heating the tube strongly a large part of the mercury may be distilled to B and the discharge becomes bright green. In this case the visible spectrum consists largely of the strong mercury lines and the cadmium triplets.

(3) If practically all the mercury is distilled to B, the tube may be operated to give a very steady discharge even when cold. In this case mercury, zinc and cadmium lines are present. The cadmium red line—the international standard—appears quite strongly under these conditions.

The result is an inexpensive but brilliant light source which transmits the ultra-violet well and which produces lines extending well into the red—facts which make the tube desirable for spectroscopic calibration. The lines are very sharp, since the tube may be operated at low temperatures and the Doppler effect is small.

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[1] C. M. Slack, *J. O. S. A.*, 18, 123, 1929.

THE ADJUSTABLE DOUBLE SLIT

MR. R. WILLIAM SHAW recently (SCIENCE, Vol. 73, April 24, 1931) described an ingenious mechanism permitting the continuous variation of the distance between two optical slits. A more complicated apparatus with means for adjusting also the widths of the two slits was devised by L. E. Dodd and G. H. Jung. (J. O. S. A. and R. S. I., Vol. 15, p. 181, 1927.) Adjustable double slits have been used chiefly for laboratory repetition of Michelson's stellar interferometer experiment.

The special problem of the adjustable double slit is, as Shaw points out, that of keeping the varying space between the slits closed. Shaw accomplishes this by sliding between the slits a tapering brass plate; Dodd and Jung employ a rolling curtain, similar to a window shade.

A method used here with success may be worthy of record on account of its simplicity. Two thin, rectangular plates, which may be of either cardboard

or brass, are hinged together along one edge and the hinge made light-tight by a backing of black paper. The free edges opposite the hinge are attached respectively to the inside jaws of the two slits. As the slits are caused to recede from or to approach each other these plates open and close like a book. When used as in the stellar interferometer the back of the book is directed away from the telescope objective and is out of the way of all other parts.

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SPECIAL ARTICLES

FURTHER OBSERVATIONS ON AN INHIBITOR PRINCIPLE ASSOCIATED WITH THE CAUSATIVE AGENT OF A CHICKEN TUMOR[1]

IN recent communications[2] attention has been called to certain evidence indicating the presence of an extractable principle in a chicken tumor, which tends to inhibit the activity of the causative agent in the transmission of this tumor. The present report deals with some additional properties of this inhibiting agent.

The most satisfactory source of this material has been found to be the desiccate of a relatively slow-growing Chicken Tumor I. A solution is prepared by extracting the desiccate with water, filtering through paper and then heating at 55° for 30 minutes to destroy the tumor-producing factor in the extract. This material, mixed with equal volumes of various concentrated, highly active fresh tumor extracts, shows a marked inhibiting action. The results of 69 test inoculations showed complete neutralization of the activity, with no tumor formation, in 59 cases (86 per cent.). The remaining 10 cases gave evidence of considerable inhibiting activity, in that the resultant tumors were, without exception, much smaller than the controls. The 30 control inoculations of the fresh extract in every instance resulted in actively growing tumors. It was further observed that heating of the extract to 65° or over damaged or destroyed the inhibiting action.

An extract of Chicken Tumor 10, a slow-growing fibrosarcoma, heated to 52° C, has been found to inhibit the development of Chicken Tumor I, a rapidly growing tumor. The results of 31 tests gave complete neutralization in 8 cases (26 per cent.), and the average size of the tumors in the remaining animals was definitely smaller than in the controls. The latter group showed 100 per cent. of actively growing tumors.

The outcome of the above experiments suggested that the inhibitors might not be so specific in their activity as the etiological agents. On the basis of this possibility, tests have been made on the action of the inhibitor on transplantable mouse sarcomas. One of the standard tumors, designated as 180, a sarcoma which gives a high percentage of takes and rarely if ever retrogresses when once established, was selected for the first test. Of 94 inoculations of tumor cell suspension, mixed with equal volumes of chicken tumor extract previously heated to 55° C, no tumors developed in 83 cases (88 per cent.). In the control group of 70 inoculations of the same tumor cell suspensions diluted with Ringer's solution, there were 15 cases (21 per cent.) which developed no tumors. Further controls with extracts of chicken liver and brain, with normal rabbit and chicken serum, and with the chicken tumor extract heated to over 65° C gave no significant variation in the number of takes or in the growth rate of the tumor from those shown by the other controls. The few tumors which occurred in the first group, resulting from the inoculation of tumor cells and inhibitor, were smaller than in the controls and tended to become stationary after the first week, or to grow very slowly.

Similar tests have been made on another mouse sarcoma, S/37, which is more rapidly growing than 180, generally killing the animal in from two to three weeks. An insufficient number of animals has been used to justify a final conclusion, but the general indications are that the chicken tumor extract reduces the number of takes and slows the development of the tumor in a significant percentage of inoculated animals. Additional tests are in progress with this tumor and on a mouse carcinoma and on a rabbit epithelioma. With the latter two neoplasms the preliminary experiments show little indication of any retarding action by the "inhibitor."

It is considered that the action of the inhibitor on the chicken tumor agent is probably a neutralizing phenomenon. With the mouse tumor the possibility exists that the result may be due to an incidental enzyme in the chicken tumor extract, which damages the tumor cells. The fact that the treated mouse tumor cells appear to multiply for a few days after

[1] From the Laboratories of the Rockefeller Institute for Medical Research.

[2] Jas. B. Murphy, O. Helmer, A. Claude and E. Sturm, SCIENCE, 73, 266, 1931; Jas. B. Murphy, *Trans. Assoc. Amer. Physicians*, May, 1931 (in press); M. J. Sittenfield, A. S. Johnson and J. W. Jobling, *Proc. Soc. Exp. Biol. and Med.*, 28, 517, 1931.