in the subcutaneous tissues in the region of the neck at the time of hypophysectomy; the remaining five served as controls. Three to seven days subsequently, the animals were divided into groups and treated as indicated in Table 1.

It will be noted that both diethylstilboestrol and estradiol dipropionate treatment led to considerable ovarian enlargement. This occurred even after the ovaries had undergone considerable involution following hypophysectomy. The average ovarian weight was 28 mg following diethylstilboestrol treatment and 13 mg following estradiol dipropionate, compared with 7 mg in the untreated hypophysectomized controls.[7] Testosterone propionate, although shown to be slightly estrogenic in both normal and hypophysectomized rats,[8,9] was without effect.

The most striking difference in ovarian growth, however, occurred in the animals implanted with diethylstilboestrol pellets and subsequently injected with chorionic gonadotropin. The average ovarian weight of the animals receiving the combined treatment was 103 mg as compared with 14 mg with chorionic gonadotropin alone. Estradiol dipropionate, although markedly estrogenic and prolonged in its action,[10] yielded ovaries weighing but 21 mg, a value not significantly greater than that secured with the sterol alone. In this respect, testosterone propionate in combination with chorionic gonadotropin also proved ineffective.

Exceedingly interesting were the microscopic findings resulting from the different types of treatment. The ovaries of the diethylstilboestrol treated animals consisted of medium-sized follicles packed tightly together and markedly reduced interstitial tissue. Estradiol dipropionate, though causing some ovarian stimulation, was not as effective as diethylstilboestrol. The ovaries of the testosterone propionate treated animals showed no significant changes.

The most pronounced effect was secured in the animals implanted with diethylstilboestrol and subsequently injected with chorionic gonadotropin. The follicles were enlarged, many corpora lutea were present, and in two instances hemorrhagic follicles were also found. Similar treatment with estradiol dipropionate and testosterone propionate in combination with chorionic gonadotropin failed to give the ovarian development secured with diethylstilboestrol.

A partial explanation for the discrepancies in the results secured with diethylstilboestrol and estradiol dipropionate in combination with chorionic gonadotropin may perhaps be found in the amount of material absorbed. The average daily absorption for diethylstilboestrol (as determined by weighing the pellets at the time of implantation and on removal at necropsy) varied from 130 to 170 micrograms as compared with 40 to 63 micrograms for estradiol dipropionate. This suggests that the estrogen level necessary to enhance the effect of chorionic gonadotropin must be relatively high. The difference in behavior of the two sterols is now under further investigation.

The significance of the experiments just described and their broader application to hypophyseal-ovarian physiology will be discussed elsewhere.

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[7] P. C. Williams, *Nature*, 14: 388, 1940, also reports ovarian enlargement in hypophysectomized rats implanted with diethylstilboestrol.

[8] A. Butenandt and H. Kudszus, *Hopper-Seyl. Z.*, 237: 75, 1935.

[9] A. S. Parkes and S. Zuckerman, *Jour. Physiol.*, 93: 16P, 1938.

[10] K. Miescher, *Biochem. Jour.*, 32: 725, 1938.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

MICROFILM WITH THE 35-MILLIMETER CANDID CAMERA

THE use of microfilm is becoming of increasing interest as is evidenced by the number of libraries offering microfilm service and the fact that at least three journals are devoted mainly to this subject. Many advantages of microfilm have been summarized by Seidell.[1] The purpose of the present note is to call the attention of scientists to the ease with which an inexpensive 35-mm camera may be used to make their own microfilm for short runs of a few pages. Such film may be read without undue eyestrain, using the Seidell hand reader costing $1.50. The price ranges of microfilm cameras and projection readers have been reported[2] as varying from $50.00 to $5,750 and from twenty to several hundred dollars, respectively. English,[3] in *American Photography*, has given details for building a complete outfit including projection reader for about $50.00.

It has been stated[4] that photostats are more useful for short runs of a few pages and microfilm is better adapted for long runs. This is undoubtedly true on the basis of cost where the service charge is an important part of the total. Nevertheless, microfilm for short articles is of great potential use to any one who has a 35-mm camera available. By means of such a camera and a stand made from laboratory

[1] A. Seidell, SCIENCE, 89: 32–4, 1939.

[2] V. D. Tate, *Jour. Documentary Reproduction*, 1, No. 3, Part 2, 6 and 36, 1938.

[3] F. L. English, *Amer. Photography*, 32: 825–8, 1938.

[4] H. H. Fussler, *Jour. Documentary Reproduction*, 2, No. 1, 3–4, 1939.

materials, a scientist may make his own microfilm and greatly increase his library at a cost of less than one cent per exposure.

It is not intended that such individually-made film should compete with that produced by bibliofilm service on long runs where the service charge is negligible in comparison with the total cost. However, there are numerous short articles, tables, diagrams, bibliographies, graduate theses, etc., which are desirable to have on file but which can not be obtained as reprints. This is particularly true of foreign publications and those trade journals which do not furnish reprints, and of detailed tables on analytical procedures from bound volumes, any of which may be borrowed for a short time from a library. For this class of work, an ordinary 35-mm candid camera, ranging in price from ten dollars up, when provided with a copying lens and cable release, is quite satisfactory. A copying lens costs a dollar and a cable release about 75 cents. Film developing can be done in an inexpensive daylight developing tank. Commercial photographers charge approximately 10 cents per roll (36 to 42 frames). Ordinary film can be obtained in 25-foot rolls at less than one cent per frame. (One-hundred-foot rolls—about 700 frames—cost about $3.00.) This film is suitable for reading with a hand reader. However, if the film is to be used in projection reading machines where it will be exposed to heat, it will be necessary to use safety-base film.

Apparatus: In the following work an Argus Model C camera, fitted with a portrait lens and a cable release, was used. The camera, with the lens pointing downward through a two-inch hole, was mounted on a specially prepared board. The camera was held in place by strips of wood around three edges; thinner strips held the face of the camera up from the board to give clearance for the shutter lever. The camera was held firmly but could be easily removed for other uses. This wooden frame was wired securely to a 6-inch ring and a large ring stand was used as a support. With the ring used, the camera lens was 6.5 in. from the rod, and this proved satisfactory for ordinary books and journals. If larger objects, such as a newspaper, were to be photographed, an extensible support would be necessary. The field covered was 8.75 in. by 13.25 in. at a height of 20 in. and 12.5 in. by 19 in. at a height of 28 in. It is helpful to have the upper and lower part of the ring stand rod marked in inches so that the height may be adjusted. Two T-shaped rods were used with ring stand clamps to hold down the edges of the journal being photographed. It is well to set the stand on a black cloth to avoid glare from polished table tops. After adjustment, it is advisable to steady the support by a brace from a second ring stand to reduce the possibility of vibration. Either strong indirect daylight or artificial light may be used for illumination.

Operation: The article to be copied was centered in position and the pages held level with the T-shaped rods. The name of the journal, date, etc., if not appearing in the article, was printed on a card and laid on the margin of the article. (This card may be used to cover portions of other articles appearing on the same page. If the microfilm is to be filed by number or subject, this data may be added and inch figures, after photographing, may be easily read without optical aid for ease in filing.) The camera support was placed at the proper height and the camera put in position. A cable release was used to avoid vibration, and the exposure was made. Time and diaphragm opening will vary according to the lighting, and a little experimentation will fix the optimum conditions. With daylight, in a well-lighted room and with fast film (Scheiner No. 23), equally good results were obtained with an exposure of 10 seconds at f:11 and 0.2 second at f:3.5. The f:11 diaphragm opening allows considerable latitude in focusing, which is helpful if journals of different thicknesses are used, since the camera height need not be changed. It was not necessary to remove the camera between exposures, the shutter being cocked by inserting the eraser end of a pencil between the support and the camera.

Discussion: The method described has been found to be very satisfactory for the making of short runs of microfilm. The films are conveniently stored in numbered glassine or kraft paper envelopes and correspondingly numbered cards are kept in the regular filing system. (Dice[5] and Brown and Austin[6] have described filing systems for microfilm.) Films should not be developed to high density and contrast because the softer grey background is easier on the eyes than a dense black. For diagrams with tiny numerals, it is desirable to take close-ups particularly when the film is to be examined with a hand reader.

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[5] L. R. Dice, SCIENCE, 89: 39–40, 1939.

[6] H. P. Brown and J. A. Austin, SCIENCE, 90: 573–574, 1939.

BOOKS RECEIVED

Cancer; A Manual for Practitioners. Pp. viii + 284. Rumford Press, Boston, agent for Committee on Publication representing the Massachusetts Medical Society and the American Society for the Control of Cancer.

FASSETT, NORMAN C. *A Manual of Aquatic Plants.* Pp. vii + 382. Illustrated. McGraw-Hill. $4.00.

MENKIN, VALY. *Dynamics of Inflammation; An Inquiry into the Mechanism of Infectious Processes.* Pp. xii + 244. 50 figures. Macmillan. $4.50.

VISSCHER, MAURICE B., Editor. *Chemistry and Medicine; Papers Presented at the Fiftieth Anniversary of the Founding of the Medical School of the University of Minnesota.* Pp. 296. Illustrated. University of Minnesota Press. $4.50.