ing changes in the embryo were observed: (a) abnormally dark pigment cells, (b) anastomosis of these cells and streaming of the pigment granules, (c) defective lens in one or both eyes, (d) diminutive forebrain. Practically the same abnormalities appeared in the embryos exposed to 5 cc. of F3 follicular extract placed in the sea water.

Thirty beating hearts stopped within an hour by 0.5 KCl were placed in sea water and 10 cc. F1 follicular extract; within 5 hours they recovered and the controls likewise began to beat in the same length of time. Thirty beating hearts placed in sea water and 10 cc. F1 follicular extract were then exposed to the KCl and within 55 minutes they had all stopped beating, while the controls ceased to beat within 58 minutes.

Conclusions: 1. Under the condition of this experiment dilute solutions of our follicular extract modify profoundly the permeability of the Fundulus egg, apparently in some cases preventing the possibilities of fertilization. 2. Changes in specific gravity of the Fundulus egg in hypertonic salt solutions after exposure to the follicular extract give additional evidence of this permeability. 3. The permeability of the cells which are already a part of the developing organism can be apparently affected by the follicular extract, and these disturbances in the injected embryo were most marked in the head region. 4. The absence of a profound difference in the restoration of heart beats in the controlled and experimental embryos is probably due to the change in permeability in the epidermal layers preventing access of the follicular extracts to the deeper tissues. 5. There was no evidence for a stimulation of cell proliferation in the Fundulus embryo.

4710

Results Obtained From Applying the Feulgen Reaction to Protozoa.

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Certain of the free-living and associated protozoa have been selected for a preliminary study of their reaction to the Feulgen thymonucleic acid test. They have been considered as to their status, source, nuclear organization and their reaction to this test. Extranuclear inclusions and organelles have received attention, as well.

Thymonucleic acid has been found to be present in some portion of the nuclear apparatus of each protozoan tested, thus far. Whether it can be said that the Feulgen reaction is indicative of the presence of chromatin is somewhat doubtful.

In *Paramecium multimicronucleatum* and *Paramecium aurelia*, both the macronucleus and micronuclei of each species gave a decidedly brilliant purple color reaction, while in the "associated" protozoan, *Balantidium coli* from the guinea pig, the macronucleus was a brilliant purple and the micronucleus a pale violet or negative. Presumably the micronuclei play similar rôles in the life-history of the two ciliates. Division stages of these two forms have not yet been secured for use in this reaction.

The food vacuoles of Paramecium contain bacteria and other ingested food particles. These vacuoles gave a faint violet reaction, which was due doubtless to the presence of the bacteria. The remainder of the protozoan was colorless.

The presence of host intestinal epithelial cells within the endoplasm of Balantidium was definitely established. The nuclei of these host epithelial cells gave the same reaction within the protozoan body as did those nuclei *in situ*, in the same field of the microscope.

The macronucleus of *Balantidium coli* showed vesicular areas similar to those previously described by the author[1] for the same species. In the Feulgen preparations these areas appeared as clear colorless vesicles, as they did when stained with alum cochineal, in contrast to their intense dark staining in Heidenbain's Iron Haematoxylin.

In the Infusoria there is generally considered to be a qualitative division of nuclear material into (1) a vegetative nucleus (macronucleus) which during division of the protozoan divides by amitosis and (2) one or more generative nuclei (micronuclei) which divide by mitosis.[2] It is interesting to note that the macronucleus in each of these ciliates contains an abundance of thymonucleic acid as indicated by the Feulgen reaction.

Giardia lamblia has been studied only in the encysted stage, with respect to this reaction. Results obtained are similar to those of da Cunha.[3] Binucleate and quadrinucleate cysts showed brilliant purple karyosomes, under this treatment, with a clear perikaryosomal

[1] Scott, M. S., *J. Morph. and Physiol.*, 1927, xliv, 436, 441.

[2] Hegner, R. W., and Taliaferro, W. H., Human Protozoology. Macmillan, 1925, 11, 17.

[3] Cunha, A. M. da, and Muniz, J., *Compt. Rend. de la Soc. d. Biol.*, 1928, xcix, 1339.

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.