other beam was reduced by being passed through a revolving sector-wheel, thus giving rise to a succession of flashes and dark intervals which fused indistinguishably in the eye, producing the appearance of a continuous flow of light of low intensity. By adjusting the sector aperture and comparing the lights in a photometer, the two lights could be made physiologically equal. On measuring the physical intensities of the two physiologically balanced lights by means of a radiomicrometer, the intermittent light was found to be about 6 per cent. stronger than the continuous light. When the two lights were made equal from the standpoint of their physical intensity and were compared in a photometer, the continuous light appeared much brighter than the intermittent one. From these results we conclude that intermittent white light is a measurably less efficient stimulus than continuous white light of the same intensity, and that in this respect the action of the retina, like that of the photographic plate, affords an exception to the Bunsen-Roscoe law. The reduced efficiency of intermittent light is probably the result of chemical induction dependent upon the frequent interruptions of the light. The sector wheel (episcotister) is therefore an unreliable means for reducing the intensity of light.

43 (652)

Preliminary communication on the cytolytic action of ox-blood serum upon sea-urchin eggs, and its inhibition by proteins.

By **T. BRAILSFORD ROBERTSON.**

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1. It has been shown by Loeb[1] that the eggs of sea urchins (*Strongylocentrotus purpuratus* and *Strongylocentrotus franciscanus*) may be fertilized by the blood-sera of mammalia, provided the eggs be previously sensitized by a brief immersion in a solution of $SrCl_2$ which is approximately isotonic with sea water.

2. I find that if ox-serum be rendered sufficiently potent by dilution (cf. below) the formation of a fertilization-membrane by

[1] J. Loeb, *Arch. f. d. ges. Physiol.*, 118, 36, 1907; 122, 196, 1908; 124, 37, 1908; "Die chemische Entwicklungserregung des Tierischen Eies," Berlin, 1909, p. 185.

the action of the serum is succeeded by cytolysis or may even be accompanied by marked agglutination of the eggs, thus confirming Loeb's view that the formation of a fertilization membrane is essentially a phenomenon of incipient cytolysis.

3. The cytolytic (and fertilizing) action of ox serum (rendered isotonic to sea water) upon sensitized sea-urchin eggs is enhanced by dilution with sea water, a maximum potency being attained at a dilution of about 1/16.

4. I find that the increase in the cytolytic activity of serum which accompanies dilution is attributable to the fact that the proteins in serum in some degree inhibit membrane-formation. The inhibitory effect of the proteins becomes negligible if these are sufficiently diluted. If a protein (*e. g.*, gelatin or ovomucoid) be added to diluted serum its cytolytic activity is greatly diminished or even abolished.

5. The inhibiting action of proteins upon cytolysis is due to the fact that they penetrate the outer membranes of the cells either with difficulty or not at all, so that by their osmotic tension they prevent the taking up of water by the cells. This is well illustrated by the fact that the order of efficiency of different proteins (the mixed proteins of serum, gelatin, "insoluble" serum globulin, casein and ovomucoid) is the reverse order of their ability to pass through the pores of a porcelain filter. The following table shows the concentrations of the various proteins investigated which were observed to permit or inhibit the formation of spherical membranes after treatment of the eggs with 50 c.c. of sea water containing 2½ c.c. of *N*/10 butyric acid for 2½ minutes and then transferring them to 50 c.c. of the protein solution in sea water:

Protein.	Highest Observed Concentration which Permits the Formation of a Spherical Membrane within 1½ Hours. Per Cent.	Lowest Observed Concentration which Prevents the Formation of a Spherical Membrane within 1½ Hours. Per Cent.
The mixed serum proteins	3.7	7.4
Gelatin	1.0	2.0
"Insoluble" serum globulin	0.3	0.6
Casein	0.25	0.5
Ovomucoid	0.125	0.25

6. It will be observed that the power of the mixed proteins of serum to inhibit membrane-formation is very strikingly inferior

to that of the other proteins investigated. On the other hand the CO_2- or "insoluble" globulin of serum, when isolated and dissolved in sea water, is no less potent than other proteins in inhibiting membrane-formation. A 0.3 per cent. solution of the "insoluble" serum globulin very noticeably inhibits membrane-formation, and yet a 3.7 per cent. solution of the mixed proteins of serum, containing 0.33 per cent. of the CO_2-globulin, under the conditions enumerated above only inhibits membrane-formation to a barely perceptible extent. These facts would appear to lend confirmation to the view advanced by Hardy[1] and myself[2] that the various proteins in sera are not present therein in the free condition, but bound together in a molecular complex.

44 (653)

Preliminary note. — The action of various agents upon the secretion of milk.

By **ISAAC OTT, M.D.,** and **JOHN C. SCOTT, M.D.**

In these experiments we used the lactating goat, obtaining the milk by aspiration with a water bottle. We found, as Mackenzie has noted, an increased secretion from venous injections of extracts of the mammary gland. The boiled gland was also active. The pineal body, corpus luteum, and infundibulin were active after a previous dose of atropin. Atropin and antipyrin greatly decreased the secretion. Pilocarpin and digitalin augmented the secretion. Pilocarpin in large doses was active after a preliminary dose of atropin. Albumoses, peptones, and glucose increased the secretion. Sodium, potassium and calcium chloride increased the secretion. Eserine, muscarine, and nicotine did not augment the secretion. 1/1000 of a drop of infundibulin increased the flow of milk, and 1/100 of a drop caused a marked increase. Infundibulin is a 20 per cent. extract of the infundibular part of the pituitary body.

[1] W. B. Hardy, *Journ. of Physiol.*, 33, 251, 1905 (Appendix).

[2] T. Brailsford Robertson, *Univ. of Calif. Publ. Physiol.*, 4, 25, 1911; "Die physikalische Chemie der Proteine," Dresden, 1912, pp. 126–133.