than others. This is particularly true of invertebrates. Respiration ceases altogether, and returns if the specimen is returned within certain time limits, to aerated water. The toad fish and killifish live in water with low oxygen content while butterfish and menhaden quickly succumb to reduction in oxygen supply.

E. The average rate of oxygen consumption for two species of marine worms is about 0.0205 c.c. per gm. per hr.; while that of two mollusks is about the same, *i. e.*, 0.0215 c.c. O_2 per gm. per hr. That of the fish, tautog, was 0.088 c.c. per gm. per hr. Most marine invertebrates consume oxygen at a very low rate; fishes at a much higher rate; with amphibia the rate is between that of invertebrates and fishes; the rate with mammals and birds is relatively high, that of birds being extremely high as compared with anatomically lower forms.

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The nutritive value of some cotton-seed products in growth.

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When certain animals are fed on a ration containing an abundance of cotton-seed meal they frequently give evidence of so-called cotton-seed injury. This has been attributed to irritation from the indigestible husks, the oil, harmful microörganisms, and specifically toxic chemical compounds. The possibility suggests itself that the rations are frequently far from ideal or adequate in respect to the various essential nutrients, inorganic salts and "accessories." Richardson and Green[1] have found that when the ration of rats is otherwise suitable, toxic symptoms do not follow the use of cotton-seed meal. With their approval we refer to our own experiments, which are still in progress. To ascertain whether

[1] This has since been published: Richardson and Green, *Jour. Biol. Chem.*, June, 1916, XXV, 307.

the cotton-seed *proteins* are notably deficient for the purposes of nutrition, we have conducted feeding experiments on rats in which these proteins furnished practically all of the food nitrogen and in which the other essential dietary components were supplied by adding to the products to be tested a suitable mixture of "protein-free milk," butter fat and starch which, with the addition of adequate protein, has been shown in hundreds of experiments to be sufficient for perfect growth. In this way we have found that satisfactory growth can be made by rats when either cotton-seed globulin or the total cotton-seed protein precipitated from alkali extracts of cotton-seed meal is employed without other significant protein sources in the mixture. No toxic symptoms have appeared, even when the supposedly harmful *meal* also was used, during a period in which the animals reached a large size. In experiments in which the inorganic components were furnished by our "artificial protein-free milk" there was no failure of growth when the cotton-seed meal was used, thus suggesting that the latter contains the equivalent of the "determinant," "food accessory," or "vitamin" deemed essential for nutrition and furnished in fat-free milk. These results corroborate the conclusions of Richardson and Green[1] soon to be published.

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The early responses of frog embryos to tactile stimulation.

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In the course of some experiments on the regeneration of the spinal cord of frog embryos, it became necessary to establish certain facts in regard to their early tactile responses, as has been done for *Diemyctylus* and *Amblystoma* by Coghill. The results of this study are briefly summarized here.

The frog embryo exhibits a reaction toward the side stimulated as its first response to tactile stimulation with a fine human hair. This occurs so constantly that it must be regarded as normal for the frog, though only an occasional and aberrant reaction in the

[1] *Loc. cit.*