quantities sufficient to instantly destroy the enzyme does not prevent reversion. Unusual interest is attached to the starch-dextrin reversion, not only because of the phenomenon *per se*, but also because it is not enzymic, and because formaldehyde prevents it. How formaldehyde is effective is problematical.

74 (484)

The rôle of alkali in the development of the sea-urchin.

By **JACQUES LOEB.**

In a former paper (1898) I have shown that the velocity of development of the eggs, is within certain limits, a function of the concentration of the hydroxylions in the surrounding solution; and I pointed out the probable connection of the action of bases with oxidations. In a later paper (1906) it was shown that at a concentration of hydroxylions below, but very close to, the point where neutral red indicates an alkaline reaction (*i. e.*, near the point of neutrality) the eggs cannot develop beyond the eight cell stage.

If we put fertilized and unfertilized eggs of Purpuratus into seawater to which a drop of neutral red has been added, at first, the fertilized and unfertilized eggs take the stain equally well. If we later transfer the eggs into seawater which is free from neutral red, the fertilized eggs gradually take all the stain while the unfertilized eggs become in the same measure decolorized. The explanation for this phenomenon lies in the fact that in the fertilized egg the neutral red enters into a chemical combination by which it becomes undiffusable; while in the unfertilized egg the neutral red is only held in solution. Since neutral red is a base it is to be presumed that the body in the egg with which it combines is an acid.

This suggested the possibility that the above mentioned acceleration of the development of the egg by other bases, *e. g.*, sodium or potassium hydroxide, might be due to a combination of these bases with the same acid with which neutral red combines in the fertilized egg. If this assumption were correct it should be expected that the addition of two or three drops of a 1/100 gram-molecular solution of neutral red to a neutral van't Hoff solution (in which the fertilized eggs cannot develop) should cause the eggs to develop into swimming larvæ. The experiment was tried and it was found that neutral red has indeed such an effect.

This observation shows that alkali allows or accelerates the development of the egg through the neutralization of an acid. It is possible that we are dealing here with one of the cases which conform with Stieglitz's theory of catalysis by salt formation.

75 (485)
How can the process underlying membrane formation cause the development of the egg?

By **JACQUES LOEB.**

In a series of previous papers it was shown that the process underlying the formation of the fertilization membrane is the essential act in the causation of development. It was further shown that this process is essentially a cytolysis or liquefaction of the superficial (cortical) layer of the cytoplasm of the egg. The question arose, how can this cytolysis or liquefaction cause the egg to develop. It seemed natural to think first of the possibility that the superficial cytolysis rendered the egg more permeable for substances required for its development.

The possibility that fertilization might increase the permeability of the egg had been considered by me in 1906 (*Biochem. Zeit.*, 1906, ii, 87). I had found that a pure solution of sodium chloride is practically harmless for the unfertilized, but very toxic for the fertilized egg. Since lack of oxygen is likewise harmless for the unfertilized and very harmful for the fertilized egg, I was inclined to ascribe the difference in the toxic effect of sodium chloride to a difference in the velocity of chemical reactions and not to a difference in the permeability of the fertilized and unfertilized egg. I have recently resumed the investigation of this question with regard to the action of salts, alkalis and acids.

(*a*) *The action of salts.* — As stated, a pure solution of sodium chloride kills the fertilized egg much more rapidly than the unfer tilized egg. In the preceding notice we have stated the concentration of hyroxylions below which the egg of Purpuratus can no longer develop. I find that below this limit a pure sodium chloride solution is much less toxic for the fertilized egg than above that limit. These experiments confirm the view that the difference in the toxic effects of a pure sodium chloride solution on the fertilized and unfertilized egg is due to a difference in the