of glucose is impaired. This can be changed very considerably by aerating the yeast in the presence of glucose. Following the aeration the respiration is increased, the aerobic fermentation strongly decreased and the capacity for synthesis restored.

The results reported may contribute to the discussions concerning the 'Pasteur reaction'. This reaction may be due to the mechanism causing storage of higher carbohydrates. The oxidation or reduction of certain systems decides whether synthesis or fermentative breakdown will occur in the cell. This interpretation combines in a somewhat modified form elements from the ideas presented by Meyerhof[6], Quastel, Wheatley[2] and Lipmann[7].

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Stockholm. March 2.

[1] *Biochem J.*, **26**, 2169 (1932). This paper unfortunately was overlooked in our previous publication[2].
[2] *Die Naturwiss.*, **25**, 540 (1937).
[3] *J. Chem. Soc.*, **123**, 2943 (1923).
[4] Sörensen, M., and Haugaard, G., *Biochem. Z.*, **260**, 287 (1933).
[5] Willstätter, H., and Rhodewald, M., *Hoppe Seylers Z.* **2**, **247**, 269 (1937).
[6] cf. Meyerhof, O., "Die chemischen Vorgänge im Muskel" (Berlin, 1930).
[7] *Biochem. Z.*, **265**, 133 (1933); **268**, 205 (1934).

Forms of *Gammarus* from Ireland

THROUGH Miss Frost, of the Ministry of Fisheries, Eire, I have received a collection of *Gammarus* from the rivers and freshwater loughs of Ireland. This collection was sent in the hope that in waters of widely differing hydrogen ion concentration, some species other than *G. pulex* (L) might be present.

On examination, however, it became obvious that the collection did not contain a single specimen of *G. pulex*. The specimens were very distinctly the allied and usually brackish-water species *G. duebeni* Lilljeb.

This is a very astonishing fact, for though *G. duebeni* is known to range into fresh water, its occurrence there is by no means common. Also, *G. pulex* is the usual freshwater form which is found generally distributed in the fresh waters of Europe, although I have not found it in the waters of high acidity in Scotland.

The Irish collection was made from rivers and loughs all over the country and the *p*H varied from 4·8 (which incidentally produced an enormous specimen) to the strongly alkaline waters of the limestone districts.

By the courtesy of Dr. Harding I have also examined the collection of *G. pulex* from Ireland in the British Museum (Natural History) and find them to be *G. duebeni* with the exception of a few specimens of *G. pulex* from Lough Erne. These are the only *G. pulex* I have seen from Ireland.

These freshwater *G. duebeni* differ only slightly from the brackish-water form. There are fewer bristles among the groups of spines on the urosome. This is merely a matter of degree and it would be very difficult, if not impossible, to draw any definite distinction anatomically between this and the brackish-water form.

A full report will appear later.

The Science Schools, Harrow School, Harrow, Middx. March 15. DOUGLAS M. REID.

Action of Insulin in Cell-free Extracts

IT has recently been reported that the Ostern reaction, the formation of hexosemonophosphate from glycogen and phosphate in muscle extract, is inhibited by glucose[1]. It was suggested it might be possible to correlate this phenomenon with known facts of carbohydrate metabolism *in vivo*. It can now be stated that an inhibition of glycogen breakdown in muscle extract can also be produced by adding minute amounts of insulin, the hormone which removes glucose *in vivo*. The same effect can be demonstrated using extract of dried yeast as enzyme. The esterification of phosphate in the Ostern reaction takes place in two steps; a non-reducing easily hydrolysable ester appears first, which is then followed by the irreversible formation of Embden ester. The second step is inhibited by insulin. The hormone, even if added at intervals, considerably retards the formation of Embden ester, but unlike glucose does not interfere with the eventual end point. It is known that *in vivo* the symptoms of hypoglycæmia, after vigorous insulin treatment, do not follow the fall of the blood sugar immediately.

Details of the action of insulin will be published elsewhere. It may be mentioned here that diabetes and hypoglycæmia can be more easily understood by considering that the essential task of insulin is rather to provide glycogen and to regulate its breakdown by the presence of the hormone itself and the level of glucose, than to lower the blood sugar. The latter may be considered the substrate of 'glucolysis proper' (Needham), the polysaccharide as the source of Embden ester which is an acceptor of further phosphate or oxygen. The loss of inorganic phosphate and the need of oxygen in insulin shock or the accumulation of compounds to be reduced (acidosis) in insulin deficiency, which is illustrated by the old saying of "fats burning in the fire of carbohydrate", may thus gain more biochemical substantiation.

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[1] NATURE, **141**, 470 (1938).

Heterochromatin at the Distal Ends of the Chromosomes in *Triticum monococcum*

Kihara and Katayama[1] and Chizaki[2] studied meiosis in haploid *Triticum monococcum* ($n = 7$) and found that the chromosomes often become attached end-to-end, especially during diakinesis. It seemed very improbable that so many duplications or interchanges are responsible for this chromosome behaviour in the haploid *T. monococcum*. I suspected that this phenomenon is probably due to associations between heterochromatic regions of non-homologous chromosomes[3,4]. In studying this problem, I fixed root tips of *T. monococcum* in one part 1 per cent platinum chloride with one part commercial formalin and stained the preparations with Newton's gentian violet. In the chromosome plates of the preparations, stained somewhat more deeply than usual, I found that small portions of the distal ends of almost all chromosomes remained dark, while all the other parts became lighter (being very deeply stained). In the accompanying illustration are shown several chromosomes drawn separately from one and the same metaphase plate. Only the lighter and the darker regions are indicated.

This finding of differential staining suggests that heterochromatin might also be located at the distal