NOTE.

Natural Indicators.—Since the publication of the article on "Some Natural Indicators" in the September number of THIS JOURNAL, Mr. G. A. Fraps has called my attention to an article entitled "The Wide Occurrence of Indicators in Nature," by himself, published in the *American Chemical Journal* for September, 1900, in which he has recorded some similar observations. H. W. BRUBAKER.

[CONTRIBUTION FROM THE CHEMICAL LABORATORY OF NORTHWESTERN UNIVERSITY.]

THE STRUCTURE OF MALTOSE AND ITS OXIDATION PRODUCTS WITH ALKALINE PEROXIDE OF HYDROGEN.

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Nef[1] and his students have established the methods for oxidizing the sugars with various agents and for separating and identifying the resulting products. Nef[2] has recently submitted a complete system of dissociation of the sugar molecule in explanation of these oxidations and in explanation of the reciprocal conversion of certain sugars under the influence of dilute alkalies.

One[3] of us investigated the products formed when maltose is oxidized with alkaline cupric sulfate. This work brought out that maltose is oxidized largely as an unhydrolyzed disaccharose, forming glucosido-acids, whose subsequent hydrolysis gives dextrose and simpler acids. There were thus obtained from 100 g. of anhydrous maltose, 34.72 g. of hydrolyzed dextrose, 29.78 g. of hexonic acids, 2.86 g. of glycollic, 0.25 g. of oxalic, 3.46 g. of formic acids, and 7.74 g. of carbon dioxide. Of unidentified material, believed to contain glycerinic and trioxybutyric acids, there remained 27.29 g., with 2.15 g. lost during the various manipulations. The ratio of the various products found was quite different from that observed by Nef[4] in a study of the oxidation products of the simple hexoses, dextrose, levulose, and mannose, especially in respect to the larger amount of mannonic lactone (21.00 g.) formed from the disaccharose. This investigation of maltose, however, failed to throw any light on the constitution of that sugar, largely because the amount of oxygen taken up by each molecule was insufficient.

The present study was therefore undertaken in the hope that the more complete destruction of the maltose molecule, under the influence of alkaline hydrogen peroxide, might permit a better quantitative separation of the products, thus reflecting the point of the glucosido union between

[1] *Ann.*, **357**, 214–312; **376**, 1–119; **403**, 204–383.

[2] *Ibid.*, **403**, 204–242.

[3] Lewis, *Am. Chem. J.*, **42**, 301–319.

[4] *Ann.*, **357**, 259.