hibitor were mixed and allowed to stand at room temperatures. Aliquots were removed at various intervals, serially diluted, and tested for hemagglutinating activity on human cells. The results are reminiscent of Hirst's description of reversal of hemagglutination (*4*) of cells, accompanied by elution of active virus and loss of cell susceptibility to further agglutination by the same virus. This similarity lends further support to the notion that the inhibitor is a derivative of, or identical with, the cell receptor. Influenza inhibitor has also been obtained from human lung.

Further details of this work and other related aspects of the problem, now under investigation, will be the subject of later communications.

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Reconsideration of the Photosynthetic Mechanism in *Chlorella*[1]

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Photosynthesis has been classically identified with the formation of carbohydrate. Theories of photosynthesis have frequently postulated a series of photochemical steps operating at all levels of reduction from carbon dioxide to carbohydrate. An a priori assumption in all such theories is that some form of carbohydrate is the direct product of the photochemical reactions. This viewpoint is consistent with data on photosynthesis in higher plants. For example, the elemental analysis of a corn plant indicates that its dry weight corresponds to almost pure carbohydrate (*3*); in short-time experiments on sunflower leaves the carbon dioxide taken up can be recovered quantitatively as carbohydrate (*6*).

Because of experimental advantages the green alga, *Chlorella pyrenoidosa*, has found wide use in studies on photosynthesis. No fundamental differences have been found between its photosynthetic behavior and that of higher plants. However, elemental analysis of the dry material of *Chlorella* is quite different than that of a higher plant, *i.e.* the nitrogen content is 8–10 per cent. As in the closely related colorless alga, *Prototheca* (*1*), the cell constituents may be considered to be about half protein and half carbohydrate. In close approximation, all the products of photosynthesis result in cellular materials. It follows that in a growing culture of *Chlorella* protein and carbohydrate syntheses must proceed at about equal rates.

The rapid synthesis of proteins (or other nitrogenous compounds) is borne out by studies of the assimilatory quotient as affected by the source of nitrogen supplied (nitrate or ammonium ion). Data obtained in manometric experiments by the usual procedures are summarized in Table 1.

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The assimilatory quotient is affected by the light intensity during measurement as well as by the nitrogen source. The effect is correlated with the following observations. Up to ~ 50 f.-c., rate of growth is proportional to light intensity and to the measured rate of gas exchange. At higher light intensities (e.g. ~ 600 f.-c.) the cells may show a much higher rate of gas exchange, but they do not grow any more rapidly than at 100 f.-c. (*4*). Although complete explanation of these

TABLE 1

Assimilatory Quotient (CO_2/O_2, Exchange Ratio) Under Light-limiting and Light-saturating Illumination as Affected by the Nitrogen Source

Nitrogen source	Illumination	
	40 f.-c.	600 f.-c.
NO_3^-	−0.5	−0.8
NH_4^+	−0.9	−0.9

phenomena is not yet available, it appears to be related to differences in the comparative rates of carbohydrate and protein syntheses which depend upon light intensity and the previous history of the cells. Discrepancies between the quotients reported here and those found by other workers may be explainable in the same way.

It has already been shown that starved cells of *Chlorella* will bring about an oxidative assimilation of acetic acid or glucose to what appears to be storage carbohydrate (*5*). This means that the processes of dark metabolism are able to effect synthesis of storage materials from respiratory intermediates. The accumulating products of photosynthesis also have been shown to be storage materials (*5*). Growing cells of *Chlorella* require protein and carbohydrate syntheses at approximately equal rates. These syntheses may result either from photosynthesis or from oxidative assimilation of an organic substrate in the dark. It is certainly reasonable to expect similarities in the pathways of the two modes of synthesis. We therefore offer, and shall further investigate, the following hypothesis: In photosynthesis the photochemical product is some intermediate, not itself carbohydrate, which may be converted subsequently to carbohydrate or to protein by metabolic pathways similar to those of heterotrophic forms.

We are well aware that this hypothesis has certain relations to, and apparent conflicts with, other theories and experimental data (e.g. *2*). There are also important implications of the low quotient at low light intensities with regard to past measurements of photosynthesis, in which a quotient of −0.9 has often been assumed. Experimental details, more complete data, and a consideration of their implications, will be reported elsewhere.

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