concerned, also by Hubrecht and by Regan. Doubtless a similar view is held by other ichthyologists at the present time.

The arrangement of the fishes continued to exercise Agassiz during succeeding years. In 1858[5] he read a communication before the American Academy of Arts and Sciences advocating the classification of fishes by the structures of the mouth as related to the facial bones. And as late as 1867 he again occupied himself with fishes, reading, in that year,[6] a paper on the classification of the catfishes.

In the light of present knowledge this classification of the catfishes was not a happy one. He regarded the group as "an order of ganoid fishes which should be placed between the sturgeons and the garpikes." He based this view, he tells us, on resemblances in the brains of the catfish and the sturgeon; but he seems to have been unduly impressed by the South American armored catfishes. To be sure such forms as *Loricaria* and *Plecostomus* are in some regards suggestive of the sturgeon; but the resemblances are now looked upon as mere parallelisms and not as signs of relationship.

In conclusion: Louis Agassiz deserves greater credit for his later than for his earlier classification of the fishes. He sought to base it on facts of anatomy and embryology and not, as with the earlier classification, on a single superficial character. And in ranking the groups as classes and in raising the selachians, cyclostomes and fishes proper, to equivalent rank, he was the forerunner of our modern views.

L. Hussakof

THE SYNTHESIS OF FORMALDEHYDE BY LIGHT WITHOUT CHLOROPHYLL

Readers of Science will be interested in the achievement by chemists of the duplication of the first step in the synthesis of carbohydrates by plants. Many years ago it was found that formaldehyde, when made slightly alkaline, transformed itself spontaneously by a series of condensations into a mixture of sugars called "formose," but the first step in the process of the synthesis of the sugars, namely, the synthesis of formaldehyde from carbon dioxide and water with the liberation of oxygen it has been impossible to achieve under conditions at all comparable to those prevailing in plants. This synthesis has now been obtained by Berthelot and Gaudechon[1] by means of ultra-violet light.

A mixture of carbonic anhydride and water under the influence of these rays liberates oxygen and produces carbon monoxide and formaldehyde. Carbon monoxide and water so illuminated produce carbon dioxide, carbon monoxide, hydrogen and formaldehyde.

Moreover, glucose under similar conditions gives rise, among other things, to marsh gas, hydrogen and carbon dioxide.

It seems not impossible, in view of these facts, that the rôle of the chlorophyll may be the transformation of the longer wave-lengths of light to shorter more active ones, thus acting in a photodynamic way, as frequently suggested.

A. P. Mathews

SPECIAL ARTICLES

NOTE ON THE DISTRIBUTION OF SOME PENNSYLVANIA FISHES

While angling at Valley Forge, on September 27, 1910, I caught a number of small fishes in Valley Creek, a tributary of the Schuylkill River. As several of these have not been found before so far to the east in Pennsylvania, I take this opportunity of recording them. These are *Pimephales notatus* and *Exoglossum maxillingua*. Along sloping shores in shallow water were very numerous large schools of small fishes, which I found to be mainly the young of the preceding, though *Abramis crysoleucas, Notropis bifrenatus, N. cornutus, Fundulus diaphanus, Lepomis au-*

[5] *Proceedings Academy Arts and Sciences*, IV., p. 108.

[6] *Proceedings Boston Society Natural History*, XI., p. 354.

[1] "Synthése photochemique des hydrates de carbone aux dépens des elements de l'anhydre carbonique et de la vapeur de l'eau en l'absence de chlorophyll, etc.," *Comptes Rendus de l'Acad. de Sci.*, 150, 1910, p. 169.