of the same series and age and of the same chlorophyll content did not agree in their rate of photosynthesis and peroxide decomposition.

The culture with less magnesium showed a lower photosynthesis but a greater ability of H_2O_2 decomposition than the other one.

EMERSON and GREEN (2) stated that the BLACKMAN reaction could be decreased without decreasing the rate of peroxide decomposition, and that there existed no significant similarity between the temperature curves of the BLACKMAN reaction and the peroxide decomposition.

I can add to their results, that the rate of the BLACKMAN reaction and the rate of peroxide decomposition are influenced in entirely different ways in cultures with different nutrient solutions, in which the photosynthesis has been decreased by age.

It must be emphasized, that the quotient $\frac{\text{photosynthesis}}{\text{chlorophyll}}$ shows often differences in the cultures from the same nutrient solution but which do not belong to the same series.

Small fluctuations in the temperature of the incubating room may be an influencing factor in this case.

The quotient $\frac{\text{photosynthesis}}{\text{mm}^3 \text{ cells}}$ is subject to still greater fluctuations. Here the addition of glucose to the nutrient solution is one of the most important factors.

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Botanical Laboratory, State University, Utrecht.
12th October, 1937.

Geology. — *The age of the Elsloo Beds.* By WILHELMINA A. E. VAN DE GEYN. (Communicated by Prof. L. G. M. BAAS BECKING).

(Communicated at the meeting of October 30, 1937.)

In the Scharberg at Elsloo on the steep banks of the river Meuse, various Tertiary beds crop out from under a diluvial covering about 10 m thick.

Between some glauconiferous sandy beds is a conglomerate which contains many phosphatic nodules and fossils — chiefly sharks' teeth and

internal moulds of Mollusca. This section attracted the attention of geologists long ago, because it was thought that here the Upper Oligocene, as yet unknown in the Netherlands, might be found.

This suggestion was put forward by VON KOENEN (1863); according to this author the fossils in situ occurring in the conglomeratic layer were of Upper Oligocene age; and he considered that the bed containing them and also the overlying glauconiferous sand belonged to a special horizon of the Upper Oligocene.

This idea was accepted later on by various other authors: ERENS, BRIQUET, KLEYN, MOLENGRAAFF, VAN WATERSCHOOT VAN DER GRACHT, VAN BAREN, JONGMANS, VAN RUMMELEN. Only a few Belgian geologists disputed this conclusion, partly on account of comparisons made with the geology of the Belgian Kempen (HALET 1920), and partly as a result of an examination of the fossils collected therefrom (LERICHE 1920).

LERICHE examined the Selachianfauna and determined a few derived Oligocene species as well as a number of Neogene forms which, according to him, occurred in situ. Therefore he concluded (like HALET) that the transgression-conglomerate and the overlying glauconiferous sandy layers were of a Middle Miocene age.

During the excavation of the Juliana-canal in 1932, by happy chance a cutting had to be made in the Scharberg at Elsloo, for here, under some diluvial gravel beds, various Tertiary strata were brought to light. The following is a summary of the succession (BECKERS 1933):

number of bed	petrographic description	thickness in m.
1	Loess	1
2	Alternating sand and gravel layers	4
3	Gravel, containing erratic sandstone and quartz-blocks	9
4	Glauconite sand	0.10
5	Fine-granular gravel layer with a few hollow sharks' teeth	0.08
6	Green glauconiferous sands, with iron-bands	0.40 — 1.25
7	Conglomerate layer, rich in fossils	0.05
8	Yellow-brownish glauconiferous sand	2.50
9	Blue-gray sandy clay	

In bed 7 a great number of phosphatic nodules were found: flints, quartz and iron concretions, together with a number of sharks' teeth and internal moulds of Mollusca.

BECKERS, who has collected the material carefully, found in $^1/_3$ m^3 327 sharks' teeth and 355 moulds.

After the material had been roughly sorted, it was presented to the Natural History Museum of Maastricht.

The Keeper of the Museum, Rector JOS. CREMERS sent this collection on to the National Museum of Geology and Mineralogy at Leyden to be examined further.

A cursory examination of this collection shewed that the fossils had been badly preserved, especially the internal moulds of Mollusca which are often much distorted. The best preserved and most easily recognisable specimens are the Selachianteeth, great numbers of which occur in the conglomerate. In examining these teeth (a comprehensive description of these will be published shortly in a treatise entitled: „Das Tertiär der Niederlande, mit besonderer Berücksichtigung der Selachierfauna" Leidsche Geologische Mededeelingen, Leiden). I noticed that all were similarly preserved; they are waterworn, broken and rolled, giving the impression of being derived.

In this large collection of teeth I have found none that did not bear traces of transportation, so that I consider LERICHE's (1920) suggestion that some of them were in situ, improbable.

After the determination of the teeth it appeared that this Selachianfauna corresponded to those from the Viennese Basin, Swiss Molasse, Rhone Basin, etc. all from Middle Miocene deposits.

Some of the most characteristic species are:

Notidanus gigas SISM., *Odontaspis* (*Synodontaspis*) *crassidens* (AG.), *Isurus hastalis* (AG.), *Lamna hasloensis*, nov. sp., *Carcharodon megalodon* (CHARLESWORTH), *Hemipristis serra* AG., *Aëtobatis arcuatus* AG., *Rhinoptera studeri* (AG.).

Without a doubt the material shews the whole to have been of Middle Miocene origin. At that time there existed an open connection between the Mediteranean and the North Sea, via the Pas-de-Calais; this sea flowed in a wide curve over North Belgium and the South of the Netherlands. The tropical climate which characterised this marine transgression, — and not those before and after — is emphasized in the derived Elsloo fauna by the occurrence of *Aëtobatis arcuatus* AG. and *Hemipristis serra* AG.

The preservation of the fossils shews that the fauna is not in situ, but has been washed out of Middle Miocene beds by a younger transgression and redeposited in lagoons.

The great percentage of sharks' teeth found in the fauna is due to the resistant nature of the enamel-covering of the teeth; other fossils have not been able to withstand the action of water and they have for the most part been either crushed or have entirely disappeared.

By which of the younger tertiary transgressions has this Elsloo conglomerate been formed?

The Upper Miocene transgression, which immediately followed on that of the Middle Miocene, probably did not extend so far South; the Southern border runs by Belfeld, Kessel and Liesel.

However, evidence of the subsequent Lower Pliocene transgression has been found in this region; a glauconiferous sandy bed of this age has been discovered, amoung other places, in a boring near Sittard.

The hollow sharks' teeth in the second conglomeratic layer (no. 5) which was formed by the still later Middle Pliocene transgression — the

last one which has stretched so far South — appear to be of Lower Pliocene age, they have been washed out of underlying Lower Pliocene beds.

The Elsloo conglomerate (no. 7) and the overlying thin glauconiferous sandy bed (no. 6) accordingly are of Lower Pliocene age.

The underlying glauconiferous sand (no. 8) is probably of Middle Miocene age. Here is the possibility however, that during the Pliocene transgression even Upper Oligocene deposits have been subject to erosion, but so no direct palaeontological evidence have yet been found to support this suggestion.

It is, however, curious that in this region no marine Middle Pliocene deposits have been discovered; in my opinion the white sandy beds, which in South Limbourg alternate with browncoal-layers, belong to the Middle Miocene dune-deposits. BREDDIN (1932) has already shown that these sands are of marine origin.

JURASKY could determine, on palaebotanical and climatic evidence, that the browncoal-layers in the neighbouring German region have been deposited under tropical conditions and because the Lower Miocene and Upper Oligocene were characterised by a more subtropical climate, there is all the more reason to consider these alternating marine sands to be of Middle Miocene age.

In any case the derived Elsloo fauna shews that locally, or in the immediate neighbourhood, marine Middle Miocene deposits must have existed.

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