

# Marine Permian Deposits in East Greenland.

## Preliminary Account.

by

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Part of the Mesozoic and Palæozoic material of the abundant collections of fossils, which were brought home in 1927 from the east coast of Greenland by LAUGE KOCH, was recently handed over to me for examination. In this material I have i. a. recognized undoubted marine Permian fossils. This is of great interest, i. a. because Permian deposits have not hitherto been known in Greenland. In the following I shall give a preliminary account of these finds as also of others, which presumably are of Permian age.

The fossil material mentioned below has been collected within two areas, viz. a southern area round Nathorst Fiord and Davy Sound, and a northern area round Cape Stosch in Gael Hamke Bay.

### 1. Nathorst Fiord.

On Depot Island near the head of Nathorst Fiord the following section was measured by LAUGE KOCH and TOM HARRIS: At the base, grey limestone (uppermost Carboniferous) overlain disconformably by a conglomerate, half a meter thick, containing well rolled shells of a *Spirifer*. The conglomerate is overlain by 5 meters of white, non-fossiliferous sandstone, and this again by pink sandstone in a thickness of 3 meters carrying a marine fauna, generally badly

preserved, comprising underterminable brachiopods and a number of big mussels, which I provisionally term *Grammysia* ? sp., since, owing to their peculiar structure they recall *Grammysia* ? *carbonaria* known from the Permian of the United States. However, the Greenland species is much bigger. It is very doubtful whether these forms can be referred to the genus *Grammysia*, but the state of preservation does not admit of a closer examination of the hinges of the valves. — In addition of this *Grammysia* the pink sandstone contains a number of undeterminable lamellibranchiates (*Leda* sp., *Astartidae* ?, and others), and further, moulds of body-chambers of highly compressed *Nautiloidae* with a pentagonal cross-section. The pink sandstone is overlain by 10 meters of dark green, shaly sandstone carrying compressed, undeterminable cephalopods ? and lamellibranchiates, among which *Pleurophorus* is of most frequent occurrence.

At Cape Brown at the mouth of Nathorst Fiord HARRIS found a loose-lying block, regarding which there is every reason to assume that it originates from a somewhat higher level than the series described above. The block, a compact, grey limestone, was crowded with mollusca which I should think can be referred to the *Bakewellia antiqua* Mstr. This mussel might indicate the presence of upper Permian beds at Cape Brown.

From our present knowledge of the stratigraphic conditions in Nathorst Fiord it must be assumed that a lower Permian marine series of strata overlain by upper Permian (Zechstein) has been developed here. However, the extremely bad state of preservation of the fauna embedded in the supposed lower Permian series does not for the present permit of a direct comparison with the Russian Permian (the Arta beds).

## 2. Cape Stosch.

In 1927 LAUGE KOCH found the upper Carboniferous limestone in this locality to be overlain by a 250 meters thick series of conglomerates interstratified with bands of sandstone. From this series were collected several samples of a

white, highly fossiliferous, oolitic<sup>1)</sup> limestone, blocks of which, according to LAUGE KOCH, must be assumed to be embedded in the conglomerate. The samples brought home do not seem to be fragments of boulders, but have more the character of pieces of rock fallen down from a fixed band of limestone at a higher level. The fauna contained in this white limestone has been preliminarily determined, and the result of this determination is recorded in the table below, where it is compared with the Zechstein faunas of England, Germany, and Russia.

	Germany Zechstein	England Zechstein	Russia Zechstein Kasan beds
<i>Geinitzella columnaris ramosa</i> Schloth. ....	×	×	×
<i>Fenestella</i> cfr. <i>retiformis</i> Schloth. ....	(×)	(×)	(×)
<i>Acanthocladia anceps</i> Schloth. ....	×	×	×
<i>Synocladia virgulacea</i> Phill. ....	×	×	×
<i>Streptorhynchus pelargonatus</i> Schloth. ....	×	×	..
<i>Productus</i> sp. indet. ....	..	..	..
<i>Strophalosia?</i> sp. indet. ....	..	..	..
<i>Dielasma</i> cfr. <i>elongatum</i> Schloth. ....	(×)	(×)	(×)
<i>Spiriferina cristata</i> Schloth. ....	×	×	..
<i>Eumicrotis speluncarea</i> Schloth. ....	×	×	×
<i>Pseudomonotis</i> sp. ....	..	..	..
<i>Bakewellia</i> cfr. <i>ceratophaga</i> Schloth. ....	(×)	(×)	(×)
<i>Bakewellia</i> cfr. <i>antiqua</i> Mstr. ....	(×)	(×)	(×)
<i>Liebea Hausmanni</i> Goldf. ....	×	×	×
<i>Myalina</i> cfr. <i>De Geeri</i> Lndgrn. ....	..	..	..
<i>Edmondia?</i> sp. ....	..	..	..
<i>Allorisma</i> sp. ....	..	..	..

The conglomeratic series passes upward into a compact, glauconitic, oolitic limestone, from which LAUGE KOCH collected a number of lamellibranchiates, *Myalina* sp. an *De Geeri* Lndgrn., *Allorisma* sp., and others. These two species are common to this limestone and the white limestone. The glauconitic limestone is overlain by Eotriassic *Ophiceras* beds.

To judge from the available data, the upper part of the

<sup>1)</sup> This limestone is not, properly speaking, an oolite, but corresponds well to the German „Schaumkalk“. The „oolite“ consists of a single shell filled with one or two calcitic crystal individuals.

conglomeratic series, from which the tabulated fauna was collected, as also the glauconitic limestone, belong to the upper Permian (Zechstein).

The fauna embedded in the white limestone has a typical German-English Zechstein character, and also shows points of resemblance to the Russian Kasan beds. However, the latter are very rich in species, while the Greenland as well as the German-English Zechstein faunas are distinguished by an abundance of specimens but only few species. Thus the upper Permian beds within these three areas have been deposited in a continental sea under extremely uniform conditions, and hence I think I am justified in concluding that the Zechstein sea, which extended from Germany over England, sent out branches covering East Greenland and Spitzbergen also. The frequent occurrence in East Greenland of a form hardly distinguishable from the Spitzbergen form *Myalina De Geeri*, makes it natural to link Spitzbergen with East Greenland and thereby with England and Germany, too. The occurrence of this long stretch of deposits of Zechstein age, which according to the character of the fauna must have been deposited in a continental sea, is more easily understood when, with WEGENER, we assume an approach of Greenland and Europa with a long and narrow geosyncline extending between the Greenland and the Fennoscandic gneiss massives. This conjecture would also facilitate the understanding of the palæogeographical conditions in these regions during other periods of the history of the earth's crust. However, I shall return to this question on another occasion.

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