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Under Ledelse af Lauge Koch

FURTHER CONTRIBUTIONS TO THE DEVONIAN STRATIGRAPHY OF EAST GREENLAND

II. INVESTIGATIONS ON GAUSS PENINSULA DURING THE SUMMER OF 1933

WITH AN APPENDIX:
NOTES ON THE GEOLOGY OF THE PASSAGE HILLS (EAST GREENLAND)

BY

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WITH 16 FIGURES IN THE TEXT AND 10 PLATES

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CONTENTS

		Page
Preface		5
I.	Introduction	7
II.	Description of the localities visited in 1933	11
	1. Margrethe Valley	11
	2. The coast profile from Margrethe Valley to Mt. Gunnbjørn	17
	3. Mt. Nathorst	21
	4. Mt. Stensiö	25
	5. The coast profile from Mt. Smith Woodward to Cape Kolthoff	25
	6. Parallel Valley	30
	7. The coast profile from the eastern end of Mt. Sederholm to Cape Kolthoff	38
	8. Remarks on Hudson Land and Strindberg Peninsula	39
III.	Stratigraphical conclusions	40
	1. The *Phyllolepis* Series or Lower Sandstone Complex	40
	2. The *Remigolepis* Series	42
	3. The Arthrodire Sandstone Series	44
	4. The Upper Sandstone Complex	45
	5. Tables of the East Greenland Devonian	46
	6. Comparison with other areas	49
IV.	Remarks on the tectonics of Gauss Peninsula	51
V.	Concluding remarks	54
Appendix		57
References		73

PREFACE

The present publication is the result of two different kinds of work: the stratigraphical field-work during the Danish Summer Expedition of 1933 to East Greenland, and a more elaborate determination of fossils and rock-types, made at home in the ensuing winter.

As to the parts based on the first kind of work I alone am responsible, whereas by far the greater part of the second kind of work was carried out by other specialists.

However, in the field-work, too, I have received much help from other persons. Thus I have to acknowledge my very deep indebtedness to Dr. LAUGE KOCH, the chief of the Danish East Greenland Expeditions, for the great privilege of joining for the third time his well-equipped expeditions, as well as for his extraordinary kindness and liberality in placing at my disposal four assistants, all trained in palaeontological collecting-work, and a most splendid outfit, including a good motor-boat and three Icelandic horses. In this connection I also wish to thank most sincerely Mr. G. SEIDENFADEN, who had to supervise all details of the outfit — a gigantic task on an expedition numbering over a hundred members.

To my four assistants, G. WÄNGSJÖ, E. OHLSSON, B. GRANSTRÖM, and T. SÄVE-SÖDERBERGH, I tender my heartiest thanks for their valuable collaboration during a time full of pleasure and work, of which, I think, we shall all of us keep the brightest memories.

As regards the work at home I am indebted to Professor E. STENSIÖ for the determination of the *Placodermi*, and to Dr. D. MALMQVIST for the preliminary determinations of the rock-types. In fact, it is only owing to the collaboration with these two specialists that the stratigraphical results put forward in the present publication can claim to be founded on a solid basis.

For further assistance in connection with the present work I have to thank Mrs. A. STENSIÖ, Miss I. EKBOM, and Mr. S. EKBLOM, who have prepared for publication the panoramas and text-figures; Mr. G. FAGRELL,

who with great skill has drawn the panoramas in colours and text-fig. 11; and Miss B. ARNELL, who typed the manuscript and assisted in various other ways.

My special thanks are due to the cartographers of the Geodetic Institute of Copenhagen, who with great kindness placed at my disposal the topographical map of Gauss Peninsula, part of which is reproduced with the geological features in pl. 9.

I. INTRODUCTION

The present paper is a report on the investigations on the Devonian of East Greenland during the summer of 1933, the third summer of the Danish Three-Year Expedition. As in 1931 and 1932, the main task of the party working under my leadership was to collect vertebrate fossils in the Devonian. In this part of our work we were still more successful than in 1931 and 1932, since the collections brought home in 1933 are larger and include still more interesting finds than those from the previous years.

But also the stratigraphical results gained during the summer of 1933 are more important than those of 1931 and 1932. My investigations in 1931 (see SÄVE-SÖDERBERGH 1932 a) led me to criticize and abandon the previous attempts to make a stratigraphical subdivision of the East Greenland Upper Devonian (ORVIN 1930; KULLING 1930, 1931). In 1932 I was able to begin a new systematisation of the formation; a long type profile was measured in Mt. Celsius, and on the basis of rich fossil finds a long profile on Gauss Peninsula subsequently investigated could be parallelised with the type profile (SÄVE-SÖDERBERGH 1933 b).

However, the areas investigated in 1931 and 1932 were very small, and the investigation of by far the largest part of the Devonian had to be left to subsequent expeditions. Moreover two well-characterized and important fossil faunas, that of Cape Graah, with *Phyllolepis* and *Bothriolepis grönlandica*, and that with *Bothriolepis* n. sp., in the western part of Gauss Peninsula, could not be stratigraphically determined in relation to the type profile.

Already in 1932 (SÄVE-SÖDERBERGH 1932a, p. 28) I suspected that a more complete investigation of Gauss Peninsula would be of great importance for the solving of the stratigraphical problems sketched out above. Accordingly, in 1933 the work was concentrated to Gauss Peninsula, and as the main object of the stratigraphical investigations I proposed the following five points:

1. An investigation of an undisturbed profile through the interesting, but very little known, Devonian deposits of Margrethe Valley;

2. A critical study of the possibility for a stratigraphical subdivision of the Lower Sandstone Complex;

3. A determination of the stratigraphical position of the *Phyllolepis-Bothriolepis grönlandica*-fauna in relation to the type profile.

4. A determination of the stratigraphical position of the fauna with *Bothriolepis* n. sp. from the western part of Gauss Peninsula.

5. An investigation of the Upper Sandstone Complex, in order to fix the boundary between the Devonian and the continental Carboniferous.

The investigation was planned in the following way (cf. the map, pl. 9):

One party (consisting of Mr. GRANSTRÖM, Mr. T. SÄVE-SÖDERBERGH, and myself), under my leadership, was to travel by motor-boat along the coast from Margrethe Valley (to solve point 1) westward to the valley W. of Mt. Smith Woodward (the W. Parallel Valley; see below, p. 31) along the N. shore of Franz Joseph Fjord, investigating the coast profile exposed here (to solve point 2, possibly point 3) and collecting Vertebrates in the richly fossiliferous localities of the *Remigolepis* Series discovered in 1932.

Meanwhile another party, consisting of Mr. WÄNGSJÖ and Mr. OHLSSON, with three Icelandic horses, was to be landed on the S. shore of Musk-ox Fjord and to set out for the central parts of Gauss Peninsula by way of Vasti Valley or the E. Parallel Valley, which, according to verbal information by other members of the Expedition, should present good conditions for travelling with horses.

The two parties were to meet in the central parts of Gauss Peninsula, where, according to BACKLUND's map (1932, pl. 2), the boundary between the Devonian and the Carboniferous could be suitably studied (point 5); and the whole investigation was to be concluded by a journey by motor-boat along the westernmost part of the S. coast of Gauss Peninsula (to solve point 4, possibly also point 3).

This plan was in the main followed by the boat-party, but various circumstances necessitated a total change of the program as regards the horse-party.

After a comparatively long stay (27/VII—7/VIII) in a camp at the mouth of Margrethe Valley, with excursions towards the inner parts of the valley and westward along the coast as far as Mt. Wiman, the boat-party on August 8th moved to the camping-place of 1932, below Mt. Wiman. In this place too the party stayed comparatively long, owing to the discovery of extremely rich fossiliferous localities, especially in Mt. Nathorst, but also in Mt. Stensiö (cf. below, pp. 21—25).

In the night after August 18th, however, having spent two whole days in packing the collections in cases, we moved by motor-boat to the mouth of the W. Parallel Valley. Thence I immediately started towards the small lake in the central part of the valley, where we were to meet the horse-party. However, on my arrival there in the early morning of August 19th I only found a tent with a note, stating that the horses could not possibly be taken to this point through the E. Parallel Valley or Vasti Valley, and that, accordingly, the horse-party had camped at Musk-ox Fjord, and was investigating the easternmost parts of Mt. Sederholm. Moreover I soon realized that in all probability the "continental Carboniferous" of BACKLUND's map was, in fact, only part of the *Remigolepis* Series, a supposition which later proved to be quite correct (cf. pp. 35—36). Consequently I had to give up point 5, the investigation of the upper boundary of the Devonian. Evidently, however, we should have good opportunities for further collecting and stratigraphical studies in the *Remigolepis* Series, if the horses could in some way or other be taken to the S. shore of Gauss Peninsula. From this point they could easily be taken to the central parts, along the northern side of the W. Parallel Valley.

I could do nothing but to return to the camp of the boat-party. So I did, and upon my return we immediately started by boat to fetch the horse-party in Musk-ox Fjord. Owing to pack-ice drifting into Franz Joseph Fjord we were forced to drive nearly half the way across to Ymer Island before we could get W. of Gauss Peninsula and turn into Musk-ox Fjord, and arrived at the camp of the horse-party, at the delta in front of Vasti Valley, in the early morning of August 20th.

Later in the same day Mr. WÄNGSJÖ and I made a very rapid investigation of the easternmost part of Mt. Sederholm, and in the meantime the three others with their united forces made a last effort to take the horses through the E. Parallel Valley, in which they succeeded, so that Mr. GRANSTRÖM could return to us in the afternoon. Next morning (the 21st) we packed the whole outfit of the horse-party into the motor-boat and travelled back through Musk-ox Fjord, round Cape Kolthoff, along the westernmost part of the S. coast of Gauss Peninsula, past KULLING's locality with *Bothriolepis* n. sp., and arrived at the mouth of the W. Parallel Valley late in the evening of the same day. Here we met Mr. OHLSSON and Mr. T. SÄVE-SÖDERBERGH, who had now crossed Gauss Peninsula with the three horses and a minimum of camp outfit.

Next day we all set out with the horses for the central part of the Parallel Valley, where we stayed till the 25th, when we had to return in order to be fetched by the expedition-ship, s. s. Gustav Holm, in the morning of August 26th.

Thus the time at our disposal was spent in the following way:

A. The boat-party:

1. Margrethe Valley 27/VII, 29/VII—1/VIII, 3/VIII, 4/VIII, 6/VIII, 7/VIII	9	days
2. The coast profile from Margrethe Valley to Mt. Gunnbjørn 28/VII, 2/VIII, 5/VIII, 8/VIII	4	—
3. Mt. Nathorst 9/VIII—13/VIII, 14/VIII	$5^1/_2$	—
4. Mt. Stensiö 14/VIII, 16/VIII	$1^1/_2$	—
5. The coast profile from Mt. Smith Woodward to Cape Kolthoff 15/VIII, 18—19/VIII, 19—20/VIII, 21/VIII	$3^1/_2$	days or nights
6. Parallel Valley 19/VIII, 22—25/VIII	5	days
7. The coast profile from the eastern end of Mt. Sederholm to Cape Kolthoff 20/VIII, 21/VIII	$1^1/_2$	—
Sum	30	days

B. The horse-party:

1. Eastern parts of Mt. Sederholm 5—20/VIII	16	days
2. Parallel Valley 22—25/VIII	4	—
Sum	20	days

II. DESCRIPTION OF THE LOCALITIES VISITED IN 1933

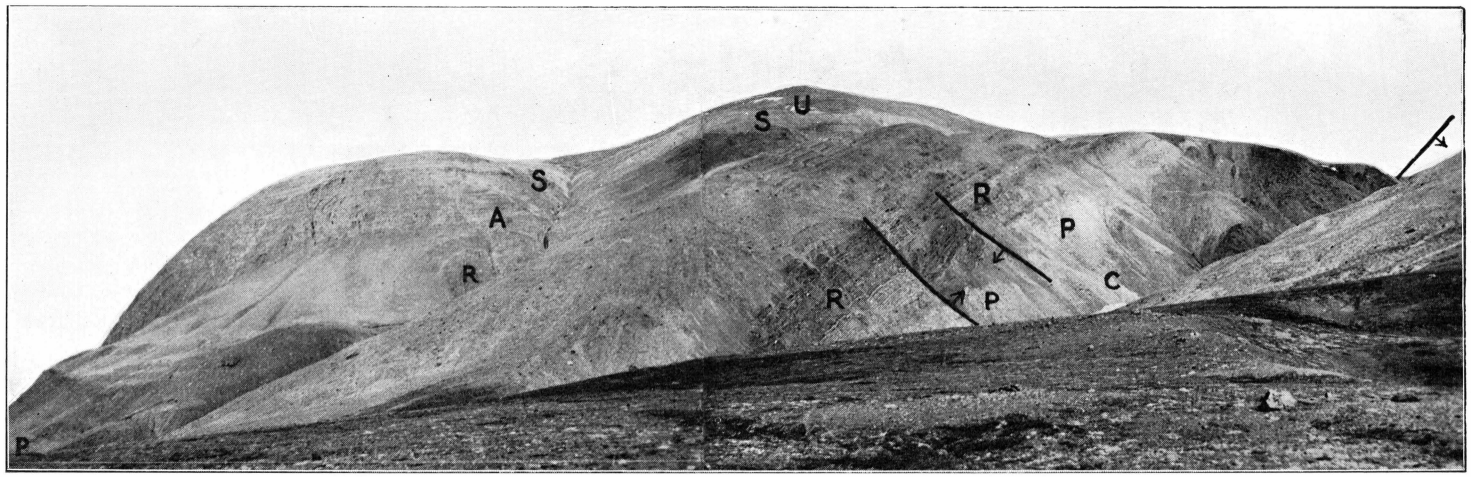
1. Margrethe Valley.

The geology of Margrethe Valley had previously been studied by KOCH (1931, pp. 60—77) and, for a very short time, by myself (1932 a, pp. 22—23). According to KOCH's description the Devonian in Margrethe Valley includes a brick-red uppermost division (KOCH's Devonian 8, KULLING's "Uppermost Red Sandstone Series" — KULLING 1931, p. 4). However, as pointed out by me in 1932 (p. 23), the presumed "uppermost red Devonian" of Margrethe Valley had never been investigated in any fairly undisturbed profile, nor had any fossils been found proving the Devonian age of the strata in question. Thus it was of great interest to obtain a good new profile through the layers exposed in Margrethe Valley, and this was our first task in the investigation of Gauss Peninsula in the summer of 1933.

All the investigations in Margrethe Valley were carried out on the W. side of the valley (see the map, pl. 9). Here the geology is fairly intricate, owing to the fact that a very important fault-line runs along the valley-side, accompanied by a series of subordinate disturbances in the neighbourhood.

Immediately W. of the large river of Margrethe Valley there is a vast, basalt-capped plateau, the Western Plateau (KOCH 1931, pl. VI). In the Western Plateau the layers are more or less horizontal, and are mainly made up of Carboniferous or Permian, and Triassic deposits (cf. KOCH 1931; and below p. 17).

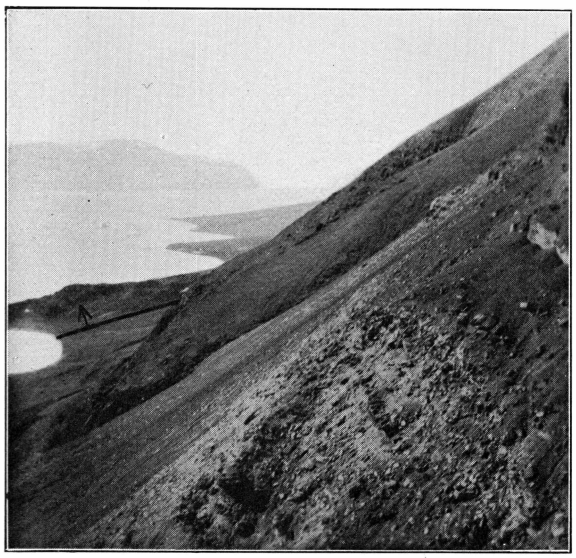
The Western Plateau is bounded on the W. by Coral Creek (KOCH 1931), and a little farther to the W. there is another creek (visible on KOCH's map 1931, pl. VI), Camp Creek, with two branches in the upper part. The area between Coral Creek and the eastern branch of Camp Creek (text-fig. 1) is highly disturbed, far more than shown in KOCH's map, and so much, indeed, as can hardly be figured in a map, except on a very large scale. This area of intense disturbances



Text-fig. 1. Mt. Obrutschew (in the background) and the disturbed area between Camp Creek and Coral Creek, seen from the E. The six letters in the left half of the figure placed along profile No. 1. *P*, Lower Sandstone Complex; *R*, *Remigolepis* Series; *A*, lower, marly, *S*, upper, sandy part of the Arthrodire Sandstone Series; *U*, Upper Sandstone Complex, on top of Mt. Obrutschew; below *C*, a very narrow strip of marine Carboniferous or Permian is seen, belonging to the E. side of Coral Creek.

is connected with the important fault-line already mentioned, extending north-south along the W. valley-side of Margrethe Valley. The area of strong disturbances narrows to the N. (see pl. 9), but can be traced a long way towards the interior of Margrethe Valley.

To the W. of the highly disturbed area just described, in the long mountain ridge called by me Mt. Obrutschew[1]) (see pl. 9), the layers are more undisturbed, though several flexures show the influence of the strong disturbances in the neighbourhood. Thus in the southernmost part of Mt. Obrutschew situated to the W. and NW. of Camp Creek



Text-fig. 2. The *Remigolepis* Series in Profile No. 1. Koch's F_1 in the background.

there is an important flexure, so that this part is not so well suited for stratigraphical studies as formerly supposed by Koch (1931, p. 61) and myself (1932, pp. 22, 23). Our profile No. 1 (see text-fig. 1) cuts across this part a little W. of the western branch of Camp Creek, and from the uppermost part of this to the summit 1082 of Mt. Obrutschew (near point 1078 on the map). In this profile we first encountered light grey or greyish-green, medium-grained sandstones, observed from about 170 m to 210 m. From 210—214 m there occur transitional rocks, then, from 215—218 m, easily splitting, brownish-red marls or fine-grained calcareous sandstones, with alternately finer and coarser cleavage, and of the type found in 1931 and 1932 to be characteristic of the *Remigolepis* Series. Sediments of this type and of other types, likewise

[1]) Named after the prominent Russian authority on Devonian fishes and stratigraphy Dm. Obrutschew.

characteristic of the *Remigolepis* Series, are found in the overlying parts of the profile up to about 500 m. The dominating rock-types are violet, reddish-brown, and greenish, splitting marls or fine-grained sandstones. It is especially noteworthy that the solid sandstones, elsewhere forming so great a part of the sediments of the *Remigolepis* Series, seem to be almost entirely absent in the above profile.

A small basalt sill was noticed near the base of the *Remigolepis* Series, at 230 m.

From 500 m up to 665 m more greyish-green easily splitting marls or homogeneous, fine- to medium-grained sandstones predominate, exactly as in the Arthrodire Sandstone Series in Mt. Stensiö (SÄVE-SÖDERBERGH 1933 b, pp. 30—31).

A dip of 10° towards the E. 42° S. was measured at a height of 555 m.

At 625—630 m and at 664—665 m there occur beds of a very hard, cross-bedded lime-sandstone, intercalated in the mainly greyish-green marls.

Above 665 m the local talus consists exclusively of hard, cross-bedded, more or less coarse sandstones of varying colour (white or greenish-grey medium-grained to coarse, light-grey coarse), partly with a pink hue of weathering, with mud-cakes and quartz-boulders.

At 779 m a white sandstone with light-green and red (felspar) grains was measured to dip 35°—40° towards the S. 38° E., and above this the local talus up to summit 1082 consists of grey sandstone, white conglomerate (boulders 0,5—1 cm in diameter), white arkose, and brick-red sandstone with white spots, of the type encountered in the next-highest part of the Upper Sandstone Complex, in the profiles of Mt. Celsius and Mt. Stensiö (SÄVE-SÖDERBERGH 1933b, pp. 20, 31).

Profile No. 1 in Margrethe Valley is interesting since it shows a sequence of strata quite analogous to that found in Mt. Celsius and Mt. Stensiö, except that it lacks the highest grey part found in the two last-mentioned mountains.

Despite a careful search it proved impossible to secure any fossils from profile No. 1. Nevertheless it seems that this profile can rather safely be correlated with those of Mt. Celsius and Mt. Stensiö, partly because of the quite similar sequence of petrographically characteristic rock-types, partly because of the evidence furnished by the subsequent study of the whole S. coast-profile of Gauss Peninsula (cf. below pp. 17—30). Thus profile No. 1 in Mt. Obrutschew may be summarized in the following way: The base is formed by a light-grey part of the Lower Sandstone Complex (45 m+). Above this there follow about 285 m of sediments, belonging to the *Remigolepis* Series. The whole of this series and the lower part (about 165 m) of the overlying grey Arthrodire Sandstone

Series — possibly including the lowermost grey Carboniferous beds (cf. SÄVE-SÖDERBERGH 1933 b, pp. 9—10) — consist almost exclusively of easily splitting marls; solid sandstones seem to be almost entirely lacking. In sharp contrast to this, the upper part of the grey series, in 1932 provisionally called the Arthrodire Sandstone Series (SÄVE-SÖDERBERGH 1933 b, pp. 9—10), consists, at least for the greater part, of hard sandstones and calcareous sandstones. — The top of the profile is formed by mainly brick-red sediments, belonging to the Upper Sandstone Complex.

However, the thicknesses of the various divisions — especially of those, forming the higher parts of the profile —, can hardly be calculated from profile No. 1 described above, owing to the above-mentioned flexure stated in the upper part of the so-called Arthrodire Sandstone Series. Thus the first result aimed at in Margrethe Valley, a fairly undisturbed profile through the Devonian strata of the area, was not yet gained.

This was done by measuring profile No. 2, running from the summit 1082 down to the Western Plateau. Here the valley-side (see pl. 1, fig. 1) slopes rather steeply, the layers are well exposed, and there are no disturbances except at the very base of the slope, where the long, important fault-line mentioned above (pp. 11, 13) passes in a N.-S. direction.

The dip in the profile is about 35°—40° towards the N. 76° W., showing that a very important flexure or fold passes between profile No. 1 and profile No. 2 (cf. pl. 9, and p. 13). The direction of the profile is about E. 38° S.—W. 38° N., and the slope is about 30°.

The above-mentioned brick-red sandstones with white patches predominate in the uppermost part of the profile, from the summit 1082 down to about 988 m, though alternating with light-red conglomerates (pebbles of quartzite) and white coarse sandstones. Cross-bedding was noticed.

From 987 m down to 980 m the layers consist of white and grey coarse sandstones, evidently corresponding to the upper, sandy, part of the so-called Arthrodire Sandstone Series. Then, from 980 m down to 813 m, there are marls or fine-grained sandstones of varying colours, greyish, yellow, and greenish, and grey limestone (Arthrodire Sandstone Series) predominating down to about 875 m, chocolate-brown to violet, brownish-red and greenish (*Remigolepis* Series) between 875 and 813 m.

Below the *Remigolepis* Series, from 813 m down to 783 m, there occurs a series of greenish-white medium-grained to coarse sandstones, partly with conglomerate pebbles and cross-bedding.

The base of the profile is formed by dark brown, or brownish-red, well stratified, looser, shaly, medium-grained sandstones, occurring from 783 m to 670 m. Below this there is a basalt dyke, and farther E.

the layers are strongly disturbed, belonging to the area of strong disturbance, associated with the important fault-line mentioned above (pp. 11, 13).

To sum up the evidence gained from this profile, there are in the E. side of Mt. Obrutschew: at the base, 195 m+ of dark brown, and 51 m of white, sandstones, belonging to the Lower Sandstone Complex; about 107 m of greenish and brownish-red marls of the *Remigolepis* Series; about 182 m of greyish and varicoloured marls, belonging to the lower, and 12 m of white sandstones, belonging to the upper part of the so-called Arthrodire Sandstone Series. The top is formed by 163 m+ of mainly brick-red sandstones, belonging to the Upper Sandstone Complex.

As shown in the map (pl. 9), the steep wall in the E. slope of Mt. Obrutschew, with well exposed profiles through the Devonian, extends far N., towards the interior of the valley. To the S. it extends to a point near the head of Coral Creek, where the area of strong disturbance begins to broaden. In the broader part of this, between KOCH's F_3 and F_4, as mentioned above, the layers are too violently disturbed to be closely described, and inter alia typical Permian or Carboniferous dolomite was noticed to occur near the western boundary of the area.

The part of Mt. Obrutschew situated between the two branches of Camp Creek has been somewhat lowered by the important flexure mentioned above (p. 15). It consists of sediments of the *Remigolepis* Series and the Arthrodire Sandstone Series.

A little to the W. of profile No. 1, and farther down towards the shore, the small profile No. 3 was measured through the upper part of the Lower Sandstone Complex and the base of the *Remigolepis* Series. The lowest parts exposed here, from 24 m up to 257 m, consist of dark brown, or yellowish-brown, well stratified, and strongly cross-bedded medium-grained to coarse loose sandstones and arkose-sandstones. They are overlain by the white sandstones forming the uppermost part of the Lower Sandstone Complex, and extending from 257 m up to 320 m. The top of the Lower Sandstone Complex is formed by a greenish conglomerate. Above this there are varicoloured marls of the *Remigolepis* Series, beginning with a green bed.

The down-slid part of the *Remigolepis* Series, marked F_1 on KOCH's map (1931, pl. VI), is well shown on pl. 1, fig. 2 of the present paper.

Throughout the accessible exposed parts of the *Remigolepis* Series in Margrethe Valley we made a zealous search for fossils. Nevertheless we did not succeed in finding a single specimen. Evidently fossils are almost entirely lacking in these strata in Margrethe Valley.

The small area SW. of KOCH's F_2 is built up of sediments very similar to the brick-red and white ones which form the top of Mt. Obrutschew. Thus KOCH's correlation of these strata seems to be quite correct.

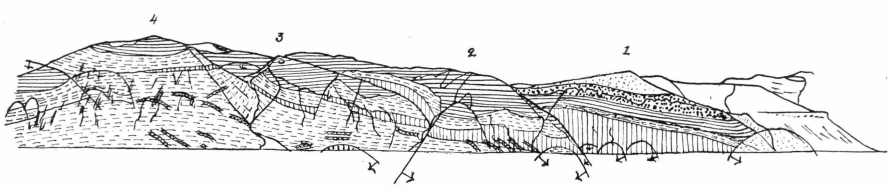
In the S. slope of the Western Plateau, in a small ravine E. of Coral Creek, brick-red, loose sandstone, of the same type as that found in the Upper Sandstone Complex, and dipping 40° towards the W. 38° S., was found to be overlain by a reddish conglomerate with small, not rounded, pebbles; the conglomerate is overlain by stratified dolomite and gypsum.

The conglomerate and the dolomite dip 13° towards the S. 38° E., and thus show a marked disconformity towards the red sandstone of the Upper Sandstone Complex. It seems quite impossible to assume that we here deal with an effect of local secondary disturbances.

Now it is evident already from KOCH's account (1931, pp. 61, 66) that in Margrethe Valley, wherever the contact between the above-mentioned red sandstone and the basal conglomerate of the marine Carboniferous or Permian has been studied, there is a marked disconformity. This was supposed by KOCH to be due to secondary minor tectonic disturbances. However, the evidence now found of a real primary disconformity in one locality makes it fairly probable that also in the localities described by KOCH the disconformities recorded are not due to later slips, but actually to an orogenic movement (Bretonian or, more probably, Sudetic or Asturian) between the deposition of the red sediments of the Upper Sandstone Complex (uppermost Devonian or, more probably, continental Carboniferous) and the overlying marine Carboniferous or Permian.

2. The coast profile from Margrethe Valley to Mt. Gunnbjørn.

On pl. 2 of my earlier publication (1933 b) the main geological features of the S. coast of Gauss Peninsula, from Margrethe Valley to Mt. Smith Woodward are represented. In the summer of 1933 I made a closer

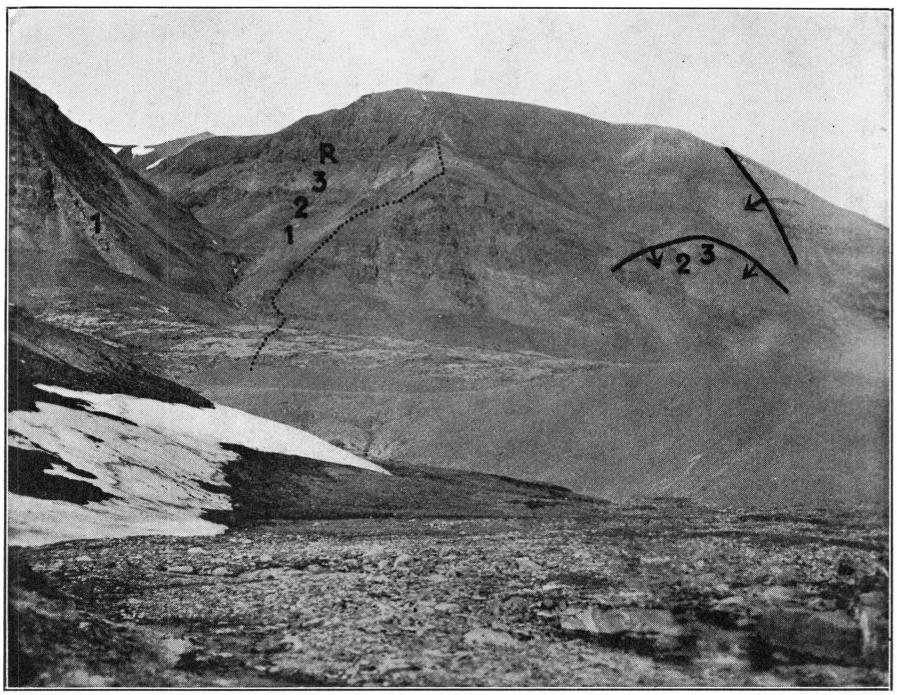


Text-fig. 3. The faults and slips in the coast section from Margrethe Valley to Mt. Gunnbjørn. Broken horizontal shading, greyish parts of the Lower Sandstone Complex; vertical shading, brownish parts of the Lower Sandstone Complex; continuous horizontal shading, *Remigolepis* Series; pointed, Arthrodire Sandstone Series; smaller points, Upper Sandstone Complex; cross-shaded, basalt; 1, Mt. Obrutschew; 2, Mt. Evans; 3, Mt. Gross; 4, Mt. Gunnbjørn.

study also of the parts between Margrethe Valley and Mt. Nathorst, which in 1932 were only studied from a distance.

From Margrethe Valley the layers rise gradually towards the W. to the top of Mt. Gunnbjørn. To the W. of this they descend again, to form the E. half of a large syncline, with its bottom in Mt. Stensiö (cf. SÄVE-SÖDERBERGH 1933b, pl. 2).

However, there is not only a continuous rise of the layers from Margrethe Valley to Mt. Gunnbjørn. A closer study of the area reveals



Text-fig. 4. Mt. Gross and the SE. corner of Mt. Gunnbjørn (to the left), seen from the S. The dotted line marks profile No. 4. *1*, *2*, *3*, Lower Sandstone Complex: *1*, greenish, *2*, brownish, *3* light grey, division; *R*, *Remigolepis* Series.

the existence of numerous smaller faults and slips, and the detailed structure of the coast profile is approximately as shown in text-fig. 3.

Immediately W. of Margrethe Valley, in the S. slope of Mt. Obrutschew, there are several small slips and a more important one (KOCH's F_1) below the SW. corner of Mt. Obrutschew which has lowered part of the *Remigolepis* Series, as already mentioned (p. 16). Above this downslid part, a more important fault, passing through the very SW. corner of Mt. Obrutschew, has lowered the strata to the W. in relation to those E. of the fault (see also pl. 1, fig. 2, and pls. 5, 9).

The long mountain ridge immediately W. of Mt. Obrutschew I have

called Mt. Evans (*2*, text-fig. 3)[1]). Below Mt. Evans a swarm of basalt dykes are seen; and the SW. corner of the mountain is lowered by a slip-like fault in relation to the main parts of it.

Mt. Evans is separated from the next mountain to the W., called by me Mt. Gross[2]), by a long, narrow valley. At the shore, below the eastern part of Mt. Gross, there is a down-slid part of the dark-brown strongly cross-bedded sandstones forming the lowermost division of the Lower Sandstone Complex in Margrethe Valley. In this down-slid part there also occur grey cross-bedded sandstones, and a band, $^1/_2$ m thick, of a conglomerate with greenish pebbles (cf. below).

The eastern half of Mt. Gross is very much disturbed by several faults, but the western half of the mountain shows more normal conditions. Here the interesting profile No. 4 was measured, from a point at the shore slightly W. of the delta between Mt. Gross and Mt. Gunnbjørn, across the highest point of the delta (260 m), and up across the SW. corner of Mt. Gross, to the lowermost parts of the *Remigolepis* Series and about as high up as 909 m (see text-fig. 4).

The dip in the lower part of the profile (1—260 m) is mainly about 16° to the W. 28° S., the slope is about 7°—10°, and the direction of the profile is S. 52° W.—N. 52° E. In the upper part the dip is 9°—10° towards the S. 18° E., the slope about 16°, and the direction of the profile mainly SW.—NE.

The whole lower part of the profile, from 1 m above the shore to 605 m, is made up of a series of mainly green or greyish-green sandstones, often strongly cross-bedded, and with ripple-marks. Conglomeratic parts are also met with (for instance at 142 m), and brown or reddish, clayey or micaceous bands occur both in the lower (for instance at 196 m) and in the higher parts (for instance at 383 m, at 385 m, etc.). A basalt dyke was noticed at 195 m. In talus of the green sandstones some fossils were found, viz. scales and cranial remains of Crossopterygians.

The series of mainly green sandstones just described can also be traced farther E. (for instance down to 63 m above the shore below Mt. Gross), where it dips about 9°—10° towards the S. 18° E. and is overlain by the dark-brown, strongly cross-bedded sandstones of the Lower Sandstone Complex mentioned above. In profile No. 4, however, it is overlain by a series, beginning at the base (606—609 m) with a very coarse, unassorted talus conglomerate with decimeter-long, and centimeter-thick slabs and sharp-edged pebbles, embedded in a greenish matrix, — but mainly built up of light brownish-grey hard homo-

[1]) After J. W. Evans, the eminent author of the best compilations (1917, 1929) on the Devonian stratigraphy of Great Britain.

[2]) After W. Gross, who in several works (1932, 1933 a, b) has given excellent contributions to the stratigraphy of the Devonian Old Red deposits.

geneous, medium-grained sandstones with brownish dots, sometimes cross-bedded, and with light brownish conglomeratic bands (for instance at 626 m, and at 639—644 m) with the boulders embedded in arkose, with kaolin and hematite. These light brownish-grey sandstones with brownish dots are found from 610 m up to 669 m, and form a markedly steeper part of the slope.

Above this steeper slope there is a more gently sloping part, built up, from 670—872 m, of a series of light grey sandstones or arkose-sandstones, often with small brown dots, sometimes cross-bedded or light reddish, and with mud-cakes, ripple-marks, and conglomeratic parts. A bed of brown, micaceous, well stratified sandstone was noticed at 858—860 m. Fragments of indeterminable fossils were found in situ at 865 m.

Two large vertical basalt-dykes are found in the parts just described of the SW. corner of Mt. Gross.

The basal layers of the *Remigolepis* Series, represented by brownish-red, splitting marls and fine-grained, stratified sandstones, are found in profile No. 4 from 872 m up to 884 m; and in these a fossiliferous horizon, with scales of *Holoptychius nobilissimus* AG.?[1]), was found at 877 m. The transitional character of this part is shown by the fact that the next seven metres of the profile, from 884—891 m, are built up of a greyish-green medium-grained sandstone. Above this there are chocolate-brown, splintery marls from 892—894 m, and brick-red similar marls from 895—909 m. Thus the characteristic type of the basal parts of the *Remigolepis* Series (consisting of dark-red or chocolate-brown marls) found in Mt. Stensiö, Mt. Wiman, Mt. Nathorst, and Mt. Gunnbjørn, but not in Margrethe Valley, is typically developed in Mt. Gross as well as in the mountains W. of this.

To sum up, profile No. 4 shows the SW. corner of Mt. Gross to be built up mainly of about 600 m + of green, 59 m of brownish-grey, and about 150 m of light grey sandstones, all belonging to the Lower Sandstone Complex, and overlain by the brownish and reddish marls and sandstones of the *Remigolepis* Series.

The series 150 m thick of light-grey sandstones found below the base of the *Remigolepis* Series in profile No. 4 evidently corresponds to the white sandstones forming the uppermost 51 m of the Lower Sandstone Complex in Margrethe Valley. Accordingly, the equivalent of the series, at least 195 m thick, of dark-brown, loose, stratified sandstones occurring below the white sandstones in Margrethe Valley is represented in profile No. 4, 6 km farther W., by a 59 m thick bed of hard, light brownish-grey sandstones with brownish dots, stated above as occurring from 610 m to 669 m.

[1]) Cf. SÄVE-SÖDERBERGH 1932 a, p. 15, foot-note.

Farther W., in Mt. Gunnbjørn and Mt. Nathorst (cf. below, pp. 21—23) the brownish-grey sandstones present a still greater similarity to the overlying grey sandstones, and can no longer be distinguished as an independent stratigraphical division.

Thus the next-highest division of the Lower Sandstone Complex in Margrethe Valley, so thick, and sharply petrographically characterized in the area mentioned, gradually decreases in thickness, and at the same time loses its individual petrographical character, as we proceed to the W. This proves once for ever the ephemeric character, and the slight stratigraphical value, of a subdivision of the Lower Sandstone Complex based upon the colour of the rock-types or their general petrographical type.

The whole lower part of Mt. Gunnbjørn is made up of the series of mainly green sandstones, described above in profile No. 4, and intruded by numerous basalt dykes, as already mentioned in my former publication (1933b, p. 28).

As shown in text-fig. 3, there is a slip or small fault just E. of the more important fault found in 1932 (SÄVE-SÖDERBERGH 1933b, p. 28, text-fig. 8, pl. 2) in the westernmost part of Mt. Gunnbjørn. The new one is recognisable owing to the visible boundary between the green sandstones and the light-grey to brownish-grey sandstones in the Lower Sandstone Complex. Two very small slips are also seen in the lowered, westernmost part of Mt. Gunnbjørn (see text-fig. 3).

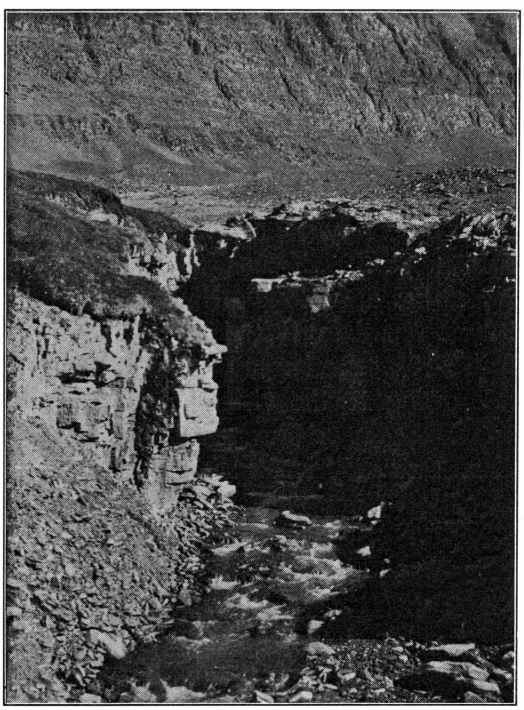
3. Mt. Nathorst.

(Pl. 2, fig. 1).

The stratigraphy of Mt. Nathorst was previously studied, though only during a very short time, in 1932 (SÄVE-SÖDERBERGH 1933b, pp. 28, 39). A profile was measured through the upper parts of the Lower Sandstone Complex in the SE. corner of the mountain, and the said parts were found to be built up of mainly grey sandstones and conglomerates, intercalated with light-red beds. In the delta proper, below the above-mentioned corner and a little to the E. of the profile, there were found beds of mainly greenish-grey sandstones, with bands of red or brown, very fine-grained sandstones, all dipping 30° to the SW. (probably disturbed). These beds evidently belong to the same series of greenish rocks that builds up the lower parts of Mt. Gross and Mt. Gunnbjørn (cf. above, pp. 19—20). No trace was found here of dark-brown loose sandstones comparable to those occurring as the next-highest division of the Lower Sandstone Complex in Margrethe Valley (cf. above, pp. 15—16, 20—21).

A little below the base of the *Remigolepis* Series, in the very SE. corner of Mt. Nathorst, a little E. of the profile investigated in 1932, there were found, in 1933, several bands (at about 385—400 m) of a

cross-bedded rock-type, remarkable for its extraordinary similarity to the green-dotted, brick-red rocks with *Phyllolepis* and *Bothriolepis grönlandica* at ORVIN's locality on Cape Graah (see ORVIN 1930; SÄVE-SÖDERBERGH 1932a, pp. 17—21). No fossils were, however, found in these beds in Mt. Nathorst, and it may already be pointed out here (cf. also below, pp. 34—35) that the petrographical similarity between these, doubtless non-contemporaneous, strata only forms one further



Text-fig. 5. Section in the river from Elsa Valley, through sediments of the Lower Sandstone Complex. In the background beds of the *Remigolepis* Series.

evidence of the unreliability of correlations over considerable distances on the basis of the petrographical character of a single rock-type.

In 1933 the uppermost part of the Lower Sandstone Complex was also studied in the middle part of the S. slope of Mt. Nathorst (below the fossiliferous horizon at 372 m mentioned below, p. 23), where the base of the typical dark-red and chocolate-brown marls of the *Remigolepis* Series is at 307 m. The base is here formed of a brown, cross-bedded rock-type (from 310 m down to 307 m), and below there are light-grey and transitional rock-types, exposed down to 294 m.

Below the SW. corner of Mt. Nathorst, the river from Elsa Valley has cut a deep section through layers of the upper part of the Lower Sandstone Complex (text-fig. 5).

Here we find mainly greenish-grey sandstones exposed from 38 m to 90 m, with a red band at 39 m, a conglomerate with green dots at 40 m, and a greyish-green, micaceous, cross-bedded rock at 89 m. The dip is here 10° towards the N. 68° W.

In Mt. Nathorst the lowermost part of the *Remigolepis* Series is formed of the very characteristic thick band of homogeneous chocolate-brown or dark-red, irregularly splitting marls, in 1932 found also in Mt. Wiman, Mt. Stensiö, and Mt. Smith Woodward. Owing to the steepness of the higher parts of the S. slope of Mt. Nathorst only the above-mentioned lowermost parts of it could be investigated in 1933, but these parts proved to be highly interesting, since they contained three fossiliferous horizons, one rather poor and two extremely rich ones. (In 1932 no fossils at all were found in Mt. Nathorst.)

The less richly fossiliferous horizon was found in a red marl at a height of 283 m, in the steep E. side of the Elsa Valley. It only yielded a few quite indeterminable fragments.

The richest fossiliferous horizon was encountered at a height of 289 m, in the W. part of the S. slope of Mt. Nathorst, at the left point marked –o– on pl. 2, fig. 1 and also shown in text-fig. 6. It proved to be extremely rich in plates and incomplete carapaces of *Remigolepis*, all seemingly of one species, *Remigolepis* cf. *tuberculata* STENSIÖ, and in scales and other remains of Crossopterygians (*Holoptychius nobilissimus* AG.?). In order to secure as many complete specimens as possible the whole horizon was broken up and brought home from an area of about 10 sq. m. The fossils became rarer or disappeared entirely at the E. and W. ends of the area broken up, and thus seem to have been present in a more or less lens-shaped part of the strata. The fossils occur in a homogeneous, reddish-grey marl, overlain by homogeneous red or chocolate-brown marls, splitting into large pieces. The chocolate-brown marl was traced up to 339 m, where it is overlain by very dark-grey calcareous sandstones (fixed at 340 m, 341 m, etc.). Thus the fossiliferous horizon at 289 m is situated about 50 m below the upper boundary of the typical lowermost division of the *Remigolepis* Series, with dark-red and chocolate-brown, homogeneous marls.

The third fossiliferous horizon in Mt. Nathorst was found in the middle of the S. slope of the mountain (the right point, marked –o– on pl. 2, fig. 1), at a height of 372 m, in strongly dark-red or purple marls or fine-grained sandstones. In this case, however, the horizon was not exposed under sufficiently favourable conditions to allow of a suitable investigation (inter alia it was rather difficult to reach owing to the steepness and loose consistency of the underlying rocks). The main part of the very rich collections from this horizon were secured in a talus cone (marked o on pl. 2, fig. 1) below the horizon.

These rich collections, though not so rich as those from the horizon at 289 m, were more interesting, since by far the greater part of the fossils turned out to be specimens of quite a new type of Vertebrates, related to the Dipnoans, but probably forming a new independent division of the *Choanata* (see for instance SÄVE-SÖDERBERGH 1934), parallel to the *Dipnoi*, the *Crossopterygii*, and the various tetrapod groups. The remainder of the material from this horizon consists of



Text-fig. 6. The fossiliferous horizon at 289 m in Mt. Nathorst.

carapaces and plates of *Antiarchi*, but curiously enough of *Bothriolepis*, not of *Remigolepis*.

The horizon at 372 m just described has a higher position also stratigraphically than has the horizon at 289 m, being situated only two metres below the boundary between the dark-red or chocolate-brown, homogeneous marls or fine-grained sandstones and the overlying dark medium-grained grey sandstones rich in mica.

It should be mentioned here that very probably those of the fossils secured in 1932 below the Bottom Terrace which were embedded in dark-red marls, originate from a horizon comparable to that at 372 m

in Mt. Nathorst, since the fossils mentioned prove to be partly identical with those from the said horizon at 372 m.

The talus between the two richly fossiliferous localities in the S. slope of Mt. Nathorst was poor in fossils, and only yielded a few indeterminable specimens. Likewise poor in fossils were the E. side of the lower part of Elsa Valley, yielding a few scales of *Holoptychius nobilissimus* AG.?, and plates, probably of *Bothriolepis*, and the part of the S. slope of Mt. Nathorst, situated E. of the investigated part of the horizon at 372 m. In the latter part nothing of interest was found.

4. Mt. Stensiö.

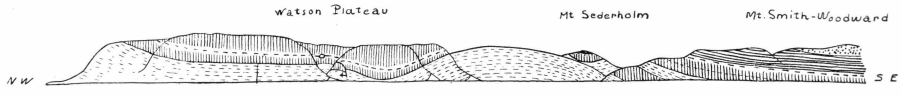
The work in Mt. Stensiö in 1933 was mainly a revision of the richest fossiliferous localities discovered in 1932 (SÄVE-SÖDERBERGH 1933b, pp. 31—36).

At the Bottom Terrace collections were made below the lowest part of the terrace, a little farther E., and still farther E., in the locality of 1932 (SÄVE-SÖDERBERGH 1933b, p. 35). The collections now include scales of *Holoptychius*, other Crossopterygian remains, and Ichthyostegids from dark-grey rock-types, and *Remigolepis* cf. *kochi* STENSIÖ, *Holoptychius*, and remains of the probably new group of *Choanata*, mentioned above (p. 24), from the dark-red marl comparable to that of the horizon at 372 m in Mt. Nathorst (see above, pp. 23—24).

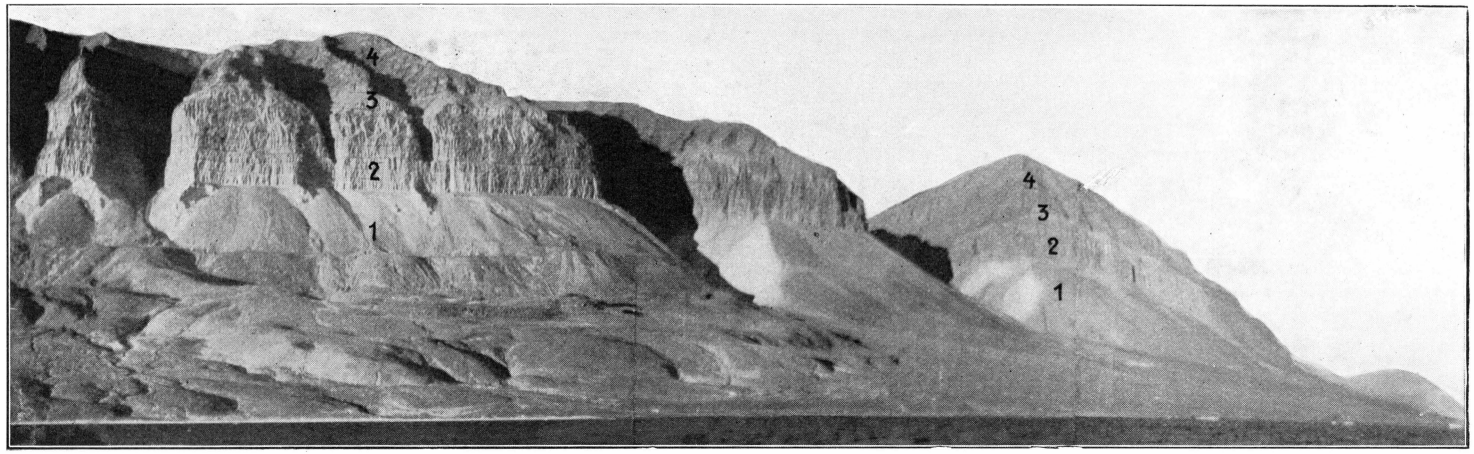
Above the western parts of the Bottom Terrace, on the central part of the S. slope of Mt. Stensiö, rich collections were secured in large talus blocks, below the locality of 1932, called "Stora Raset" (SÄVE-SÖDERBERGH 1933b, p. 36). The material secured here in 1932 and 1933 includes: *Remigolepis incisa* STENSIÖ, *R. acuta* STENSIÖ, *R.* n. sp.? (with a very small pectoral fin), Crossopterygians, Ichthyostegids, and *Choanata* of the new group.

5. The coast profile from Mt. Smith Woodward to Cape Kolthoff.

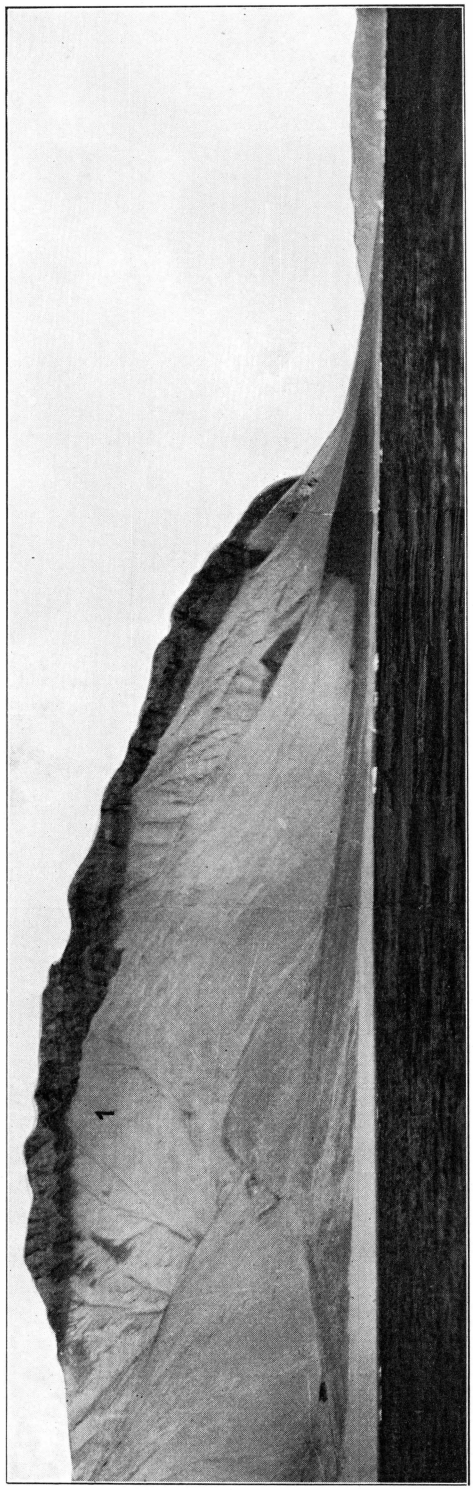
The coast profile from Mt. Smith Woodward to Cape Kolthoff (text-fig. 7) may be described as consisting of two parts, an anticline, forming the eastern, and a syncline, forming the western half of the profile. In



Text-fig. 7. Diagram, showing the structure of the coast section from Mt. Smith Woodward to the W. end of the S. coast of Gauss Peninsula — seen from the SW. Horizontal broken shading, grey, vertical shading, striped, brownish or red, parts of the Lower Sandstone Complex; continuous horizontal shading, *Remigolepis* Series; dotted, Arthrodire Sandstone Series.

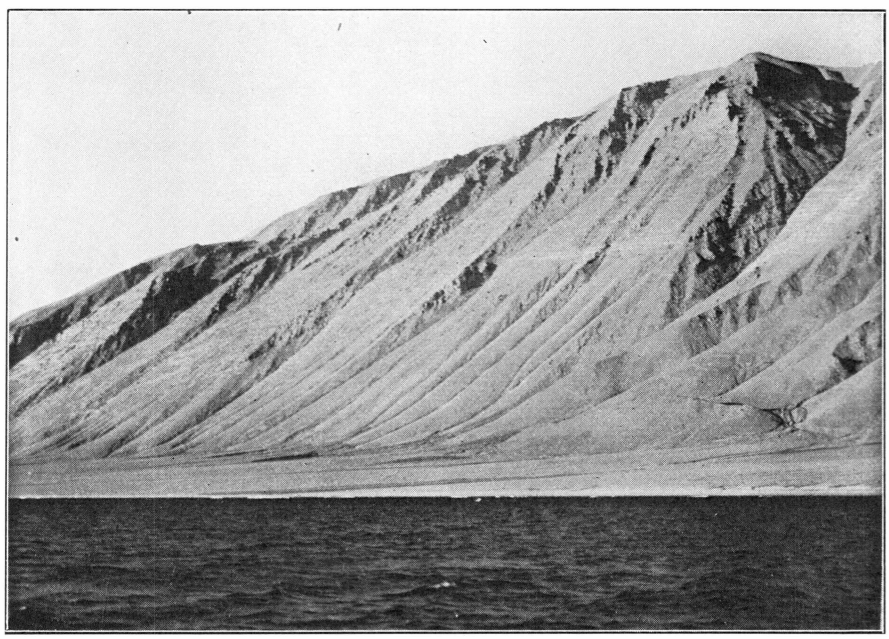


Text-fig. 8. The south coast of Gauss Peninsula W. of KULLING's locality No. 8 (Bothriolepis Cleft). *1*, *2*, *3*, *4*, local divisions of the Lower Sandstone Complex; *1*, *3*, light grey; *2*, *4*, striped, brownish, divisions. KULLING's locality situated in the cleft (Bothriolepis Cleft) immediately left of the right series of numbers.



Text-fig. 9. South-western corner of Gauss Peninsula. *1*, light grey, *2*, striped, brownish divisions of the Lower Sandstone Complex.

the anticline the layers rise continuously, from the bottom of the other syncline, described above and in 1933 (SÄVE-SÖDERBERGH 1933b, p. 27), in Mt. Stensiö, through the whole complex of Mt. Smith Woodward; and the top of the anticline is a little W. of the mouth of the W. Parallel Valley, W. of Mt. Smith Woodward, in a very gentle slope, leading towards Mt. Sederholm (cf. below, p. 32). To the W. of this the layers again descend and pass into the syncline, forming the westernmost part of the S. coast profile of Gauss Peninsula. This syncline has



Text-fig. 10. Light grey or white sediments of the Lower Sandstone Complex in the W. coast of Gauss Peninsula.

a rather short and steeply sloping E. limb, whereas to the W. of the lowest part of the syncline the strata rise more gently towards the W. coast of Gauss Peninsula.

The greater part of the eastern half of Mt. Smith Woodward is formed by sediments of the *Remigolepis* Series, overlain by a thinner cap, consisting of sediments belonging to the Arthrodire Sandstone Series, and underlain by strata of the uppermost part of the Lower Sandstone Complex. Owing to the continuous rise to the W. of the layers in Mt. Smith Woodward, the western half of this mountain complex (pl. 2, fig. 2) is chiefly made up of varicoloured sandstones of the Lower Sandstone Complex, overlain by the lower parts only of the *Remigolepis* Series, whereas the Arthrodire Sandstone Series has been removed by erosion.

Of greatest interest is the development in Mt. Smith Woodward of the thick series exposed of the Lower Sandstone Complex. Judging from the colour of the rocks, no less than six divisions may be distinguished. The profile has the following aspect:

Top: *Remigolepis* Series

Lower Sandstone Complex
- 6. light yellowish or greenish-grey division;
- 5. striped blackish-brown and light grey division;
- 4. striped reddish-brown and light yellowish division;
- 3. light yellow division, white at the top;
- 2. brown division;
- 1. grey division.

It hardly need be pointed out that these divisions have a strictly local stratigraphical importance.

In the other side of the anticline described, and in the syncline W. of that (text-figs. 8, 9), striped sediments, of the type represented by divisions 4 and 5 mentioned above, are found to predominate, and to form the whole of the upper parts of the westernmost part of Gauss Peninsula. The *Remigolepis* Series is, beyond doubt, absent from this part of the Peninsula. KULLING's "Upper Red Sandstone Series", at his locality No. 8, with *Bothriolepis* n. sp. (KULLING 1931, p. 13, fig. 4; SÄVE-SÖDERBERGH 1932a, p. 27; 1933b, p. 38), is only the upper half of a striped division of the Lower Sandstone Complex, and should in no way be distinguished as an independent series from the lower half of the same striped division situated below the insignificant light grey band in the middle of the striped division, which band is described by KULLING as the "Midmost Grey Sandstone Series" (see text-figs. 7, 8).

Thus the horizon with *Bothriolepis* n. sp. was found in 1933 to be situated a considerable distance below the upper boundary of the Lower Sandstone Complex, probably approximately in the middle of this complex.

Below the striped division of the Lower Sandstone Complex there is in the westernmost part of Gauss Peninsula[1]) a very thick series of white, grey, and greenish-grey sandstones, especially well exposed in the western limb of the syncline, stated above to form the western half of the coast profile here described. These mostly white sandstones form the landscape at the W. coast of Gauss Peninsula (text-fig. 10), which

[1]) Below the large plateau, called by me Flett Plateau, after Sir JOHN FLETT, the Director of the Geological Survey of Great Britain, who has always shown a great and active interest in the Old Red fossils and stratigraphy.

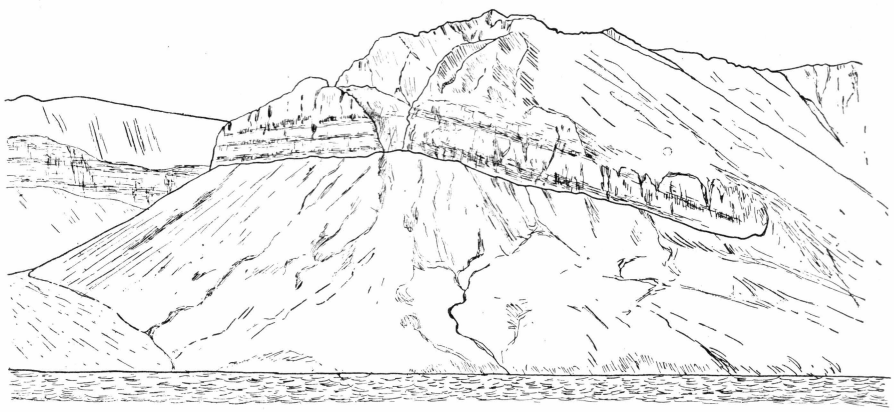
they give a very characteristic aspect. Judging from the composition of the deltas in the area in question these sandstones contain much clay.

The continuous rise of the layers in the western limb of the syncline discussed above is interrupted by a flexure just E. of the Bothriolepis Cleft (KULLING's locality No. 8), as shown in text-fig. 11. In the same place a small down-slid part is seen in the very steep slope leading down to the coast from the snow-capped plateau that forms the inland and was named Watson Plateau[1]) by me (cf. pl. 5).

6. Parallel Valley.

(Pl. 3, figs. 1, 2; pls. 4, 5, 9).

Judging from the previously published map (BACKLUND 1932, pl. 2), the area along Parallel Valley, between Musk-ox Fjord and Franz



Text-fig. 11. Flexure and down-slid part in the wall E. of the Bothriolepis Cleft, with KULLING's locality No. 8. Drawn by G. FAGRELL after a photograph by the writer.

Joseph Fjord, exhibits a rather peculiar geological structure. According to BACKLUND, the boundary between the Devonian and the Carboniferous of this area slopes gently, but markedly, towards the S. from the E. end of Mt. Victor Madsen to the mountain ridge forming the background of Parallel Valley (our E. Parallel Valley; cf. below, p. 31), but farther S. the said boundary rises very abruptly, in the small part figured by BACKLUND between the mountain ridge mentioned and the shore of Franz Joseph Fjord. Continental Carboniferous beds should thus be present in the top of the eastern end of Mt. Victor Madsen, in several small areas in the highest parts of Mt. Sederholm, in the upper half of Mt. "Karboncirkus", and in the highest parts of the mountain ridge mentioned above, in the back part of Parallel Valley.

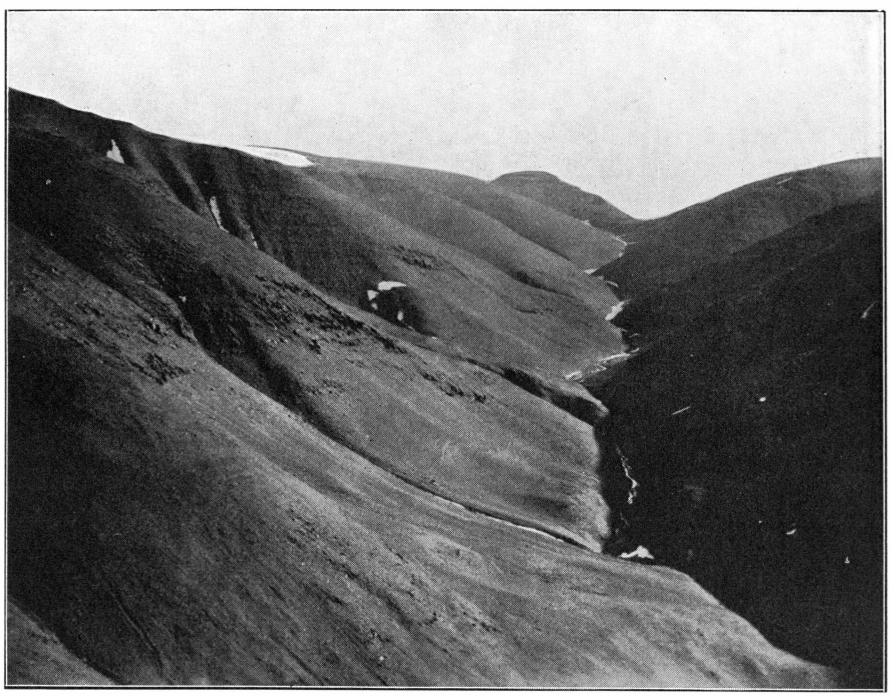
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[1]) After D. M. S. WATSON, the brilliant British writer on Old Red fishes and early tetrapods.

Now, first of all it should be pointed out that the real topography is fairly different from what is shown in BACKLUND's map.

The Vasti Valley, figured on this map as nearly cutting across Gauss Peninsula, with a height of the col of 400—500 m, is in reality much shorter and deeper, and the col leading to Franz Joseph Fjord is at about 900 m.

The Parallel Valley, on the contrary, actually forms a marked depression across the whole Gauss Peninsula, with a mainly NE. –SW. trend,



Text-fig. 12. Kerstin Valley, seen from the N., with sediments of the *Remigolepis* Series. In the background Mt. Stensiö, with beds of the Arthrodire Sandstone Series and the Upper Sandstone Complex; to the left Remigolepis Ridge; to the right Mt. Smith Woodward.

from Musk-ox Fjord in the NE. to Franz Joseph Fjord in the SW. The col is at about 450 m. There may be distinguished between the E. Parallel Valley, leading down to Musk-ox Fjord, and the W. Parallel Valley, leading down to Franz Joseph Fjord. The former is about 13 km, the latter about 15 km long. In both valleys the rivers have cut deep canyons, broadening only in the very highest parts, just below the col. But while the E. Parallel Valley is rather narrow and thus almost inaccessible for horses, the W. Parallel Valley is fairly broad, and its N. side, in particular, has large terraces, which form excellent paths for transports by horse. In these terraces there are always places

where the tributary rivers have not cut down very deeply, whereas in the steeper slopes and narrower terraces in the E. Parallel Valley and in the S. slope of the W. Parallel Valley the tributary rivulets form continuous deep canyons, which can hardly be crossed by a horse.

One of the large terraces of the slopes of the W. Parallel Valley is approximately on a level with the plain at the highest point of the pass, whence it descends almost to Franz Joseph Fjord.

Above this terrace and the plain at the col, a slope leads up to another terrace, which is especially well marked in the easternmost parts of the S. side of the W. Parallel Valley (see pl. 4, fig. 2). From this terrace the surrounding mountains rise to 1300—1400 m.

The main part of the southern slope of the W. Parallel Valley is formed by the northern side of the large snow-capped mountain complex, named Mt. Smith Woodward by me. This is bounded on the E. by a fairly long valley, Kerstin Valley (text-fig. 12), discovered by us in 1933, and leading up to the N. side of Mt. Stensiö, with passes leading to Aina Valley in the SE., and to Britta Valley in the SW.

E. of Kerstin Valley there is a long ridge, the Remigolepis Ridge, about 1400 m high, with a mainly N.-S. trend, and leading to the snow-capped elevation seen in the background of Aina Valley on pl. 2 of my former publication (1933b).

The Remigolepis Ridge has a very steep eastern side, leading down to a large, glacier-filled valley, Glacier Valley (see pl. 4). The glaciers of this valley originate around the highest point of the central parts of Gauss Peninsula, Mt. Harder.

In the area between Glacier Valley, the E. Parallel Valley, and Gille Valley (see pls. 5, 9) there is a large mountain complex called by BACKLUND Mt. "Karboncirkus" and Mt. Bøggild. Since, as will be shown below, the former of these names is geologically misguiding, it will be dropped — in accordance with wishes expressed by the former mappers, Professor BACKLUND and Mr. SEIDENFADEN. Mr. SEIDENFADEN proposes the new name Circus Mountain, which will be used in the present paper. From the higher parts of the Circus Mountain several circus valleys lead down to the E. Parallel Valley.

The whole N. side of the E. Parallel Valley, and most of that of of the W. Parallel Valley are formed by the long and high ridge called Mt. Sederholm (BACKLUND 1930; 1932, pl. 2).

The highest terrace already mentioned (p. 32), above the col of the Parallel Valleys, is situated, in the middle of the double Parallel Valley, at a height of 572 m. Here it marks the boundary plane between the Lower Sandstone Complex and the *Remigolepis* Series. From this point the boundary plane rises to the E., W., and N., but descends towards the S., in the direction towards the middle of

Text-fig. 13. View towards the NW. from Remigolepis Ridge. Mt. Smith Woodward to the left; to the right Remigolepis Ridge in the foreground, Mt. Sederholm in the background. Below *1*, *Phyllolepis* Series (Lower Sandstone Complex); *1*, *2*, *3*, divisions of the *Remigolepis* Series: *1*, dark-red, *2*, greyish, *3*, reddish.

Mt. Stensiö. In the Circus Mountain this boundary plane slopes towards the W., and in the higher parts of Mt. Sederholm it rises towards the W. and E. from the middle of the mountain, where it is found at 764 m (see text-fig. 13; pl. 3, figs. 1, 2). — Finally, as will be mentioned below, the boundary between the *Remigolepis* Series and the Lower Sandstone Complex is seen at a still higher level, at about 1300 m, in the top of the eastern part of Mt. Victor Madsen, on the N. side of the Vasti Valley (pl. 3, fig. 3).

Thus it is evident that in the part of Gauss Peninsula situated between Gille Valley, Mt. Harder, and Mt. Gunnbjørn to the E., and the mountains W. of Mt. Victor Madsen and W. of the mouth of the W. Parallel Valley to the W., the Devonian strata form a large syncline, with an axial dip of about 3° towards the S. 10° W. The lowest parts of the syncline are found along a line passing from the middle of the Bottom Terrace, below Mt. Stensiö, at the shore of Franz Joseph Fjord, through the middle of Mt. Stensiö, along the Kerstin Valley, through the middle of Mt. Sederholm, and the E. part of Mt. Victor Madsen.

The E. end of Mt. Sederholm, as will be further mentioned below (p. 38), is affected by strong disturbance, and according to BACKLUND (1930, p. 276; 1932, pp. 42—43, pl. 2) in part built up of sediments of Pre-Cambrian age.

The Lower Sandstone Complex in the Parallel Valleys was studied mainly at three points, viz., 1) in the middle part of the canyon of the large river in the W. Parallel Valley, at the junction of this river with the westernmost large tributary from the S.; 2) in the middle of the S. slope of Mt. Sederholm, below, and in the so-called Profile Ravine (see pl. 3, fig. 1); 3) in the opposite side of the valley, below the base of the *Remigolepis* Ridge. The details of the profiles in the two last-mentioned localities will be given below, since they form parts of profiles which also include the *Remigolepis* Series, and in locality 3) also part of the Arthrodire Sandstone Series. In locality 1) there was found a hard, grey sandstone with badly preserved plant fossils (stems).

Otherwise the Lower Sandstone Complex is built up, as usual, of mostly medium-grained, or coarse, sandstones of varying colour and type. More markedly striped divisions, of the same type as in the coast profile of Mt. Smith Woodward and Watson Plateau, are especially well exposed in the E. and W. ends of Mt. Sederholm.

The most interesting result of the studies in the Lower Sandstone Complex in the Parallel Valleys, however, was the finding of good vertebrate fossils in this series, which is mostly poor in organic remains.

Already during my first excursion (19/VIII) in the W. Parallel

Valley to meet the horse party, I found in talus on the S. side of the canyon a block of greyish sandstone with a plate of *Phyllolepis*. When later we met with Mr. WÄNGSJÖ and Mr. OHLSSON, it proved that they too had found *Phyllolepis* remains, in the E. Parallel Valley (and in Vasti Valley, cf. below, p. 38).

The best locality, however, was discovered during our common stay at the col (22—25/VIII), below the Profile Ravine, at a level (about 541 m above the sea) marked —·—·— on pl. 3, fig. 1. Here, as in other localities, the fossils were found in local talus, but their origin from the highest part of the Lower Sandstone Complex is beyond every doubt. — The fossils secured in the E. Parallel Valley have been determined by STENSIÖ (1934) as *Phyllolepis* sp. Especially interesting is the well preserved material from below the Profile Ravine, including two species of *Phyllolepis*, *P. orvini* HEINTZ and *P. söderberghi* STENSIÖ (1934)[1]), at least one large species of *Bothriolepis*, and scales of *Holoptychius nobilissimus* AG.? Thus the fauna from this locality, imbedded in a brownish-red, very fine-grained sandstone, and for a minor part in a more greyish sandstone, and with a stratigraphical position, 225 m at most, below the base of the *Remigolepis* Series, is evidently of exactly the same type as the fauna found in ORVIN's locality at Cape Graah (see ORVIN 1930, pp. 16—17; HEINTZ 1930, pp. 35—45; 1932, pp. 5—17; SÄVE-SÖDERBERGH 1932a, pp. 17—21, text-figs. 10—14; 1933b, pp. 22—24). Now, for the first time, we are able to state the stratigraphical position of the fauna with *Phyllolepis* and *Bothriolepis*, which evidently occurs in different horizons[2]) in the upper part of the *Lower Sandstone Complex*. Accordingly this preliminary name of the series in question can now be substituted by the name *Phyllolepis Series*.

The *Remigolepis* Series also presents very interesting conditions in the Parallel Valleys and the surrounding mountains. Here it clearly consists of three well distinguished divisions: 1) a basal, intensely dark-red or chocolate-brown, marly, less well stratified division; 2) a middle, better stratified, mainly dark-grey division; 3) an upper, likewise well stratified, more reddish division.

The areal distribution of these three divisions will be evident from pls. 3, 4, and text-fig. 13.

[1]) STENSIÖ's study of this material has, in fact, given quite a revolutioning result. Formerly *Phyllolepis* was generally referred to the *Heterostraci* among the *Ostracodermi*. On the basis of his study of the East Greenland material, STENSIÖ shows that in reality *Phyllolepis* is nearly related to the *Arthrodira* (STENSIÖ 1934).

[2]) The horizon at Cape Graah is possibly not situated at the same distance from the base of the *Remigolepis* Series as the horizon below the Profile Ravine in Mt. Sederholm (cf. also below, p. 43).

The basal division represents a slightly thicker equivalent to the dark-red or chocolate-brown band of marls, so characteristically developed in Mt. Smith Woodward, Mt. Stensiö, Mt. Wiman, Mt. Nathorst, and Mt. Gunnbjørn (SÄVE-SÖDERBERGH 1933b, pp. 28, 29, 33, 34; above pp. 23—25), and also present in Mt. Gross (see above, p. 20), but absent from the easternmost parts of the area studied in 1933, in the district of Margrethe Valley. This division in the area around Parallel Valley often forms a steep part of the slope, and possibly is the part taken by BACKLUND (1930, pp. 274—276; 1932, pl. 2) to be the basal conglomerate of the continental Carboniferous.

The middle, dark-grey division is the series described by BACKLUND (1930, pp. 274—276; 1932, pl. 2) as continental Carboniferous. It is referred by me to the *Remigolepis* Series, because in the overlying, upper, reddish division we found several horizons rich in *Remigolepis* (cf. below, p. 37).

The upper, reddish division is overlain in the Remigolepis Ridge by grey coarse sandstones, referred to the Arthrodire Sandstone Series, because they are evidently continuous with the sediments of the same series in Mt. Stensiö (cf. below, pp. 37—38; and SÄVE-SÖDERBERGH 1933b, pp. 30, 31).

After this general account we may turn to the detailed description of the profiles. The short time at our disposal in this our last working-area in 1933 only allowed us to measure two long profiles, 1) one in the Profile Ravine in Mt. Sederholm (pl. 3, fig. 1), 2) the other in and below the Remigolepis Ridge (pl. 4).

1) The first fixed rock encountered in the Profile Ravine was a finely banded, yellow, cross-bedded, sandstone, with bands of very dark green to blackish calcareous sandstone, building up the profile from 577 to 763 m. Green-dotted rocks were found at 590 m and at 620 m. The uppermost part of the series of sandstones now described is darker, and richer in mica.

The base of the *Remigolepis* Series, with a marked terrace, is at 764 m. The lower division of this series, from 764 to 830 m, is made up of homogeneous dark-red and chocolate-brown, splitting marls. A harder dark-grey band was noticed at 807 to 808 m.

Above 830 m another terrace occurs, and the overlying strata, up to a height of 1005 m, are made up of various dark-grey sandstones and marls, intercalated with more sparsely occurring bands of red, splitting marls, exactly as in the corresponding part of Mt. Wiman (SÄVE-SÖDERBERGH 1933b, pp. 29—30). The dark-grey rocks mentioned have a light-grey hue of weathering.

The upper boundary of the middle, dark-grey, division of the *Remigolepis* Series in the profile described is marked by a thin band

of bluish limestone, with a yellowish hue of weathering, at 1005 m. Above this is found the thickest division of the *Remigolepis* Series, the upper, reddish division, forming the top of the profile (1006 — about 1300 m). Owing to lack of time its lower part only could be studied in the profile described. This part, at least, consists of alternately reddish-brown and grey, in great part easily splitting, marls, and bands or lenses of hard, cross-bedded, dark-grey sandstone (occurring from 1102 m upward). In the lower part of the profile no fossils were found, but at 1105 m, 1118 m, and about 1120 m several fossiliferous horizons occur, rich in scales of *Holoptychius nobilissimus* AG.?, and in specimens of *Remigolepis* with ornamentation of the *acuta-* and *incisa*-types (partly very well preserved specimens).

The direction of the profile is nearly E.-W., the position of the strata is nearly horizontal.

To sum up, the closely investigated part of the profile shows about 212 m of varicoloured sandstones of the *Phyllolepis* Series (Lower Sandstone Complex) and 408 m of the *Remigolepis* Series. Of the latter, 76 m belong to the lower, dark-red division, 200 m are made up of the middle, dark-grey, division, and the uppermost 132 m consist of the upper, reddish, division, with several *Remigolepis*-horizons.

2) The profile in and below Remigolepis Ridge shows a similar sequence of strata, though more complete in the uppermost parts (here including the top of the *Remigolepis* Series and the basal parts of the Arthrodire Sandstone Series), and, unfortunately, incomplete in the middle parts, which are covered by abundant talus masses.

The *Phyllolepis* Series (Lower Sandstone Complex) was here followed from 516 m up to the terrace at 572 m mentioned above (p. 32). Among the rock-types may be mentioned a medium-grained, mica-bearing, light-red arkose-sandstone, found at 516 m.

In the *Remigolepis* Series, stated to occur from 572 m up to 1312 m, no detailed stratigraphical studies were possible owing to the large talus-masses covering the solid rock. The following rock-types could, however, be distinguished: a shaly, fine-grained, reddish-brown sandstone at 1291 m, and a splitting marl at 1312 m.

An interesting, richly fossiliferous horizon, was found in a very splintery, dark-red marl, at 1292 m. Here scales and a fairly good cranial roof of Crossopterygians and plates of *Remigolepis* were found.

From 1313 m to the top of the profile, at 1407 m, at the N. end of a large snow-cap, there are coarser, mainly light-grey, sandstones, referable to the so-called Arthrodire Sandstone Series (cf. above, and SÄVE-SÖDERBERGH 1933b, pp. 9—10). The rock-types collected here include a grey sandstone, found at 1407 m, a medium-grained, grey, shaly sandstone, and a fine-grained, dark-grey, shaly, calcite-cemented

sandstone. Plant fossils were also found here, viz. stem fragments, determined by Professor HALLE as *Knorria* sp.

The most important evidence gained from the profile just described is that the thickness of the whole *Remigolepis* Series is here about 670 m, and that there seems to be no marly lower part in the Arthrodire Sandstone Series.

From the top, at 1407 m, one has a splendid view across Mt. Sederholm, the Circus Mountain, Glacier Valley, and the area around Mt. Harder (see pl. 4, fig. 1; cf. pl. 9). The latter area, like the area around the middle of the Parallel Valleys, is evidently built up of sediments of the *Phyllolepis* Series (the lower parts of the mountains), and the *Remigolepis* Series (the upper parts of the mountains). The only part with a doubtful geological structure is the upper half of Mt. Harder, which is made up of dark rocks in which no stratification could be observed. Very probably the upper part of Mt. Harder consists of basalt, but this is, of coarse, only one of the many possibilities that exist.

7. The coast profile from the eastern end of Mt. Sederholm to Cape Kolthoff.

The very eastern end of Mt. Sederholm, as mentioned above, is strongly disturbed, and, according to BACKLUND (1930; 1932, pp. 42—45), the rocks occurring here belong partly to the Eleonore Bay Formation (Pre-Cambrian) partly to a series of Pre-Cambrian volcanic rocks.

The Devonian to the W. of the strongly disturbed area consists for the greater part of light-red and grey sediments, belonging to the *Phyllolepis* Series (Lower Sandstone Complex), and only the highest parts of the E. end of Mt. Sederholm consist of sediments of the lower and middle divisions of the *Remigolepis* Series (cf. above, pp. 35—36).

Immediately below the base of the *Remigolepis* Series there is a grey, not very thick, division of the *Phyllolepis* Series. Below this there is a thick, light-red and varicoloured division, more strongly red in the lower, and varicoloured in the upper parts. In the red division samples of a light-red, stratified conglomerate (pebbles 0,5—1 cm in diameter), and also of a hard white sandstone were collected.

In Vasti Valley Mr. WÄNGSJÖ and Mr. OHLSSON collected specimens of *Remigolepis* in the lower, dark-red, division of the *Remigolepis* Series (in a reddish-brown marl), and a small material of *Phyllolepis* and *Holoptychius nobilissimus* AG.?, from talus, about 300 m below the base of the *Remigolepis* Series.

In the eastern part of Mt. Victor Madsen, E. of Vasti Valley, sediments of the *Remigolepis* Series are found in the very top of the mountain (see pl. 3, fig. 3). Below, there are grey and striped reddish

sediments of the *Phyllolepis* Series, and the lowest part, which is especially well visible farther E. in the coast profile described, consists of a thick series of grey and greenish-grey sandstones. A sample taken E. of Mt. Victor Madsen consists of a greenish sandstone similar to the greenish sandstone found in the lowest parts below Mt. Gunnbjørn and Mt. Gross (cf. above, pp. 19—20).

The different conglomerates occurring at the "Musk-ox Fjord Inlier", studied by WORDIE (1927), KOCH (1929a, pp. 71—74), PARKINSON and WHITTARD (1932), BACKLUND (1932, pl. 2), WISEMAN (1932), and TEICHERT (1933, pp. 38—44), were observed from a distance, from the boat. This part is figured on pl. 5 mainly after TEICHERT (1933, figs. 15, 18).

However, in order to secure some time for further work in Parallel Valley we had to travel very rapidly along the coast, and hence could undertake no close study of the coast section discussed. Such a close investigation is one of the points left for the work of a coming year. Here it should only be pointed out that all the areas consisting of Devonian rocks are built up of the *Phyllolepis* Series, mostly of its lower parts.

8. Remarks on Hudson Land and Strindberg Peninsula.

The Musk-ox Range on Hudson Land (NE. side of Musk-ox Fjord; see SEIDENFADEN 1931, pl. 3) is mainly made up of grey sandstones, overlain by reddish sandstones, all of Devonian age, according to ORVIN (1930, fig. 4, I).

Considering the geological structure of the nearest parts of Gauss Peninsula, it seems very possible that the grey sandstones belong to the lower part of the *Phyllolepis* Series (Lower Sandstone Complex) and the reddish sandstones to the middle or the upper part of the same series.

Similarly, the grey sandstones building up the E. parts of Strindberg Peninsula (see KOCH 1929a, text-fig. 22, pl. III) may probably be equivalent to the grey or white sandstones on the opposite shore of Nordfjord, in the westernmost part of Gauss Peninsula (cf. above, pp. 29—30, text-figs. 9, 10).

III. STRATIGRAPHICAL CONCLUSIONS

1. The *Phyllolepis* Series or Lower Sandstone Complex.

The sediments of the *Phyllolepis* Series or Lower Sandstone Complex, as it was preliminarily termed by me in 1933 (1933b, p. 10), show a very variable petrographical type, and moreover often a very important similarity to continental Carboniferous deposits (cf. the Appendix). Already because of this the series discussed can hardly be subdivided, or even recognised, on the basis of general petrographical characters. But still more important is the argument furnished by the study of the coast profile from Margrethe Valley to Mt. Gunnbjørn. Here a thick dark-brown division, sharply characterized petrographically, observed in the E. part of the coast section studied, is seen to decrease gradually in thickness to the W., and at the same time to change its petrographical type, so as to become indistinguishable from the overlying light-grey division. And farther W., in Mt. Smith Woodward and the S. slopes of Watson Plateau and Flett Plateau, still other sequences of petrographical types are found in the *Phyllolepis* Series or Lower Sandstone Complex.

In the type profile through the subdivisions of the East Greenland Upper Devonian — in Mt. Celsius (see SÄVE-SÖDERBERGH 1933b, pp. 8—10, 16—21) — no fossils have been found in the Lower Sandstone Complex.

Thus the basis for a reference of strata from other localities to the Lower Sandstone Complex must in the first instance be a position immediately below the base of the *Remigolepis* Series, which is well characterized by its fossil contents. On this basis the stratigraphically lowermost parts of the Devonian in the S. coast profile of Gauss Peninsula and in the profiles exposed in the Parallel Valleys and the nearest surroundings are referred with certainty to the Lower Sandstone Complex.

Now, in the highest beds of the Lower Sandstone Complex, immediately below the *Remigolepis* Series, in the Parallel Valleys, there occurs a fauna of a distinctly characterized type: with *Phyllolepis*

orvini HEINTZ and *P. söderberghi* STENSIÖ, a large *Bothriolepis*, and *Holoptychius nobilissimus* AG.? — Another fauna, with the small *Bothriolepis* n. sp. (STENSIÖ 1931, pp. 160—165; SÄVE-SÖDERBERGH 1932a, pp. 27—28), is found much lower down in the Lower Sandstone Complex or *Phyllolepis* Series, in the westernmost part of the S. coast profile of Gauss Peninsula.

Thus the higher parts, at least, of the *Phyllolepis* Series (Lower Sandstone Complex) are characterized by an Upper Upper Devonian fauna with *Phyllolepis*, a large *Bothriolepis*, and *Holoptychius*. This furnishes another basis for correlation with strata of other localities, and proves that the sandstones of the Cape Graah Syncline (cf. SÄVE-SÖDERBERGH 1932a, pp. 17—21; 1933b, pp. 22—24, 38) with ORVIN's fossiliferous locality (ORVIN 1930, pp. 16—17; SÄVE-SÖDERBERGH 1932a, pp. 17—21; HEINTZ 1930, pp. 35—45; 1932, pp. 5—17; STENSIÖ 1934) also belong to the *Phyllolepis* Series (Lower Sandstone Complex), probably to the higher part of this, the fauna of ORVIN's locality likewise consisting of *Phyllolepis* (*orvini* HEINTZ), a large *Bothriolepis* (*grönlandica* HEINTZ), and *Holoptychius* (*nobilissimus* AG.? and *giganteus* AG.?).

Accordingly the grey and light-red sediments building up the whole E. part of Gunnar Andersson Peninsula (cf. SÄVE-SÖDERBERGH 1933b, pp. 22—24) may now with a comparatively great degree of certainty be referred to various parts of the *Phyllolepis* Series (Lower Sandstone Complex).

On the basis of the apparent general tectonic relations, the possibility — or even probability — has been pointed out that the light-coloured sediments of the Musk-ox Range on Hudson Land and of the E. parts of Strindberg Peninsula (cf. above, pp. 38—39), as well as those of Mt. Rudbeck on Geographical Society Island (cf. SÄVE-SÖDERBERGH 1933b, pp. 21—22) also belong to the *Phyllolepis* Series.

Though of very varying petrographical type, all the sediments of the *Phyllolepis* Series seem to have one character in common, viz. the more or less coarse, sandy or conglomeratic, consistency. But this, of coarse, is of little value for the recognising of the series in doubtful localities, since such rock-types are very common in East Greenland in deposits from many geological periods, inter alia in continental Carboniferous deposits, which may show a most astonishing petrographical similarity to certain beds of the *Phyllolepis* Series (cf. the Appendix).

Thus a reference to the *Phyllolepis* Series also of the Devonian beds W. of Mt. Celsius, S. of the Dusén Fjord (SÄVE-SÖDERBERGH 1933b, pp. 22—24), of those of the W. parts of Geographical Society Island, and of those of the W. parts of Traill Island (SÄVE-SÖDERBERGH 1932a, pp. 23—28) would at present rest on a very doubtful basis, and this question has, in fact, to be left for further investigations.

It likewise remains to investigate more closely the relations of the *Phyllolepis* Series to the presumed basal layers of the Devonian — the talus conglomerates in Musk-ox Fjord and other localities (cf. above and SÄVE-SÖDERBERGH 1932a, p. 28).

The thickness of the *Phyllolepis* Series is naturally rather variable and difficult to estimate. In the W. parts of Gauss Peninsula it no doubt exceeds 2000 m.

2. The *Remigolepis* Series.

The *Remigolepis* Series is everywhere well characterized by its fossil contents — except in Margrethe Valley, where it was recognised after being traced along the S. coast profile of Gauss Peninsula. It has been found in two important areas, 1) in the complex of Mt. Celsius (KULLING 1930, ORVIN 1930, 1931; SÄVE-SÖDERBERGH 1932a, 1933b), 2) in the middle parts of Gauss Peninsula, extending from Margrethe Valley and Mt. Harder in the E. to Mt. Smith Woodward, Mt. Sederholm, and Mt. Victor Madsen in the W.

A general petrographical feature of this series is the marly consistency and the generally dark colours of its sediments, which show well stratified and uniform layers.

Farthest SE., in Margrethe Valley, the whole series is thin and almost exclusively made up of easily splitting marls; and in the western parts of Gauss Peninsula, W. of Mt. Evans, the basal part of the series is characteristically developed, consisting almost exclusively of dark-red and chocolate-brown, homogeneous marls. Otherwise bands of hard sandstones are of frequent occurrence, intercalated between the more marly beds.

In the western parts of Gauss Peninsula a local subdivision of the *Remigolepis* Series into a thin lower, dark-red, marly division (76 m), a thicker middle, dark-grey division (200 m), and a thickest upper, reddish division (394 m) can be observed.

The thickness of the whole *Remigolepis* Series, as shown below (p. 46), varies from about 107 m in Margrethe Valley to 380 m in Mt. Celsius, 670 m in Remigolepis Ridge, and about 800 m in Mt. Stensiö. This, of course, makes it difficult to correlate with exactness the different fossiliferous horizons. With great reservation the relative stratigraphical position of the horizons may, however, be approximately calculated, as shown in the following table, also including the fossiliferous horizons of the *Phyllolepis* Series and the Arthrodire Sandstone Series.

As will be evident from the account given above and in my previous works (1932a, 1933b), the *Remigolepis* Series is by far the richest fossiliferous part of the East Greenland Upper Devonian (cf. STENSIÖ 1931, 1934; SÄVE-SÖDERBERGH 1932b). The fossils most frequently found are the various species of *Remigolepis* and scales of Holoptychiids

Table of the fossiliferous horizons in the East Greenland Upper Devonian.

	Fossiliferous horizons in stratigraphical order:	Approximate distance from base of *Remigolepis* Series	Twice this distance in the case of the *Remigolepis* Series in Mt. Celsius, unaltered for other series and for localities on the south coast of Gauss Peninsula, $\frac{800}{670}$ of this distance in Mt. Sederholm and Remigolepis Ridge
Arthrodire Sandstone Series	Holoptychiids and indeterminable Placoderms, 1100—1300 m in ORVIN's profile in Mt. Celsius	400—600 m	800—1000 m
	Grönlandaspis mirabilis HEINTZ?, 1002 m in Mt. Stensiö	970 m	970 m
	Grönlandaspis mirabilis HEINTZ, 1140 m in ORVIN's profile in Mt. Celsius	440 -	840 -
Remigolepis Series	*Remigolepis kochi* STENSIÖ?, 812 m in Mt. Stensiö	780 -	780 -
	Remigolepis, and Crossopterygians, 1292 m in the Remigolepis Ridge	652 -	779 -
	Crossopterygians, 658 m in Mt. Celsius, S. slope	300 -	600 -
	Remigolepis (with ornamentation of the *acuta*- and *incisa*-types), 1120 m in Mt. Sederholm	407 -	486 -
	Remigolepis (with ornamentation of the *acuta*- and *incisa*-types), 1118 m in Mt. Sederholm	405 -	484 -
	Remigolepis (with ornamentation of the *acuta*- and *incisa*-types), 1105 m in Mt. Sederholm	390 -	466 -
	Remigolepis incisa STENSIÖ — *R. acuta* STENSIÖ, 330 m in Mt. Stensiö, 350 m in Mt. Wiman	330 -	330 -
	Remigolepis acuta STENSIÖ, 499 m in Mt. Celsius, S. slope	145 -	290 -
	Remigolepis sp., 536 m, above the Western Upper Plateau	135 -	270 -
	Remigolepis kochi STENSIÖ?, 567 m, above the Eastern Upper Plateau		
	Remigolepis sp. (with an ornamentation of the *acuta*-type), 535 m, above the western part of the East Plateau	85 -	170 -
	Emarginata-horizon, 545 m, above the easternmost part of the East Plateau	80 -	160 -
	Remigolepis sp., 534 m, above the easternmost part of the East Plateau	70 -	140 -
	Bothriolepis, Crossopterygians, and new group of *Choanata*, 372 m in Mt. Nathorst; and *Remigolepis* cf. *kochi* STENSIÖ from below the Bottom Terrace, Gauss Peninsula	69 -	69 -
	Possibly *Remigolepis* sp. a (with an ornamentation like that of *Bothriolepis*), from below the Eastern Terrace, Mt. Celsius, S. slope	25—70 m?	50—140 m?
	Remigolepis n. sp. and Crossopterygians, 289 m, in Mt. Nathorst	21 m	21 m
Phyllolepis Series.	*Phyllolepis orvini* HEINTZ, *P. söderberghi* STENSIÖ, *Bothriolepis*, and *Holoptychius nobilissimus* AG.?, below the Profile Ravine, Mt. Sederholm	< 225 -	< 269 -
	Phyllolepis orvini HEINTZ, *Bothriolepis grönlandica* HEINTZ, *Remigolepis* sp., *Holoptychius nobilissimus* AG.?, and *Holoptychius giganteus* AG.?, in ORVIN's locality, Cape Graah	probably between 150 and 300 m	
	Bothriolepis n. sp., in the westernmost part of Gauss Peninsula	probably between 500 and 700 m	

(*Holoptychius nobilissimus* AG.? and *H. giganteus* AG.?)[1]). Of less frequent occurrence, but of extraordinary interest, are cranial remains of Crossopterygians and Dipnoans, and, above all, the Devonian Stegocephalians (*Ichthyostegidae* and also other forms) and the quite new group of *Choanata* mentioned above (pp. 23—24). The occurrence of *Bothriolepis* in the lowermost part of the *Remigolepis* Series is interesting since the occurrence of this genus seems to be generally a characteristic feature of the underlying *Phyllolepis* Series.

3. The Arthrodire Sandstone Series.

The Arthrodire Sandstone Series, including the lowermost grey, possibly Carboniferous Sandstones (cf. SÄVE-SÖDERBERGH 1933b, pp. 9—10), is the grey series overlying the *Remigolepis* Series.

It has been observed with certainty in Mt. Celsius (SÄVE-SÖDERBERGH 1933b), in Margrethe Valley, and in the middle parts of Gauss Peninsula from Mt. Nathorst to Mt. Smith Woodward, and on top of the Remigolepis Ridge.

The only fossil Vertebrates noted in this series occur in the lower half of it, in Mt. Celsius (ORVIN 1930, SÄVE-SÖDERBERGH 1933b, pp. 9, 10) and Mt. Stensiö, where a fragment of *Grönlandaspis mirabilis* HEINTZ?, was found in 1932 at 1002 m, and has now been determined by STENSIÖ (1934). The fauna includes the Arthrodire *Grönlandaspis mirabilis* HEINTZ, indeterminable *Placodermi*, and scales of *Holoptychius*.

Thus nothing indicates a Devonian age of the beds above the lower half of the series discussed. On the contrary, the plant fossils found in nearly all localities where higher parts of the series are exposed indicate that most probably even the upper part of the series is Carboniferous (Dinantian). The plant fossils mentioned are of a very uniform type, and all represent stems, determined by Professor HALLE as *Knorria* sp. and, according to him, indicating, though not definitely proving, a stratigraphical position of the strata in question similar to that of the Culm deposits in Spitsbergen. Professor HALLE has most kindly pointed out to me an important argument for the Carboniferous age of the strata discussed, viz. that the stem fragments found in them are identical in shape with stem fragments from the Dinantian of Spitsbergen, as figured by NATHORST (1902), whereas no connection is found with the Upper Devonian flora of Bear Island (NATHORST 1914).

Thus most probably deposits of two different formations are included in the series provisionally called the Arthrodire Sandstone

[1]) Cf. SÄVE-SÖDERBERGH 1932a, p. 15, foot-note.

Series. Accordingly it is of very great interest that in Margrethe Valley the series discussed is found to consist of two sharply distinguished subdivisions, a lower, marly, division, forming a direct continuation of the marly sediments of the *Remigolepis* Series, and an upper part, mainly consisting of coarse, white to grey, sandstones. It seems very probable that the sharp boundary between the two divisions mentioned of the so-called Arthrodire Sandstone Series represents the boundary between the uppermost Devonian and the Lower Carboniferous.

In the other localities the boundary discussed above is not so sharply defined (cf. SÄVE-SÖDERBERGH 1933b, pp. 19—20, 30—31), and on top of the Remigolepis Ridge a specimen of *Knorria* was found (though in talus) not far (about 80 m) above the top of the *Remigolepis* Series. Thus further investigations are necessary to fix definitely the Devonian-Carboniferous boundary in the various localities.

After a definite fixing of the Devonian-Carboniferous boundary the Carboniferous part of the so-called Arthrodire Sandstone Series must, of course, be excluded from this series and placed with the divisions of the Upper Sandstone Complex.

In Margrethe Valley the thickness of the lower, Devonian, part of the series discussed — that is, the Arthrodire Sandstone Series sensu stricto (cf. SÄVE-SÖDERBERGH 1933b, pp. 9—10) — is about 182 m; and the upper, probably Carboniferous, part is about 12 m thick, the whole series thus measuring about 194 m in thickness. This is an unusually small thickness for the whole series, which in Mt. Stensiö attains about 400 m and in Mt. Celsius about 500 m.

The sediments of this series seem on the whole to be more sandy in Mt. Celsius and in the Remigolepis Ridge, and more marly only in the lower parts from Mt. Stensiö to Margrethe Valley. Horizons with black shales were noticed in Mt. Celsius and in Mt. Stensiö (SÄVE-SÖDERBERGH 1933b, pp. 19—20, 30—31).

4. The Upper Sandstone Complex.

In Mt. Celsius and in Mt. Stensiö the Arthrodire Sandstone Series was found in 1932 (SÄVE-SÖDERBERGH 1933b, pp. 20, 31) to be overlain by a series of strongly brick-red, or red-white-mottled, hard sandstones. This brick-red division is also seen to occur on top of Mt. Nathorst (SÄVE-SÖDERBERGH 1933b, pl. 2).

In 1933 quite the same series of brick-red and mottled rocks, intercalated with grey or white conglomerates, etc., was found to overlie the so-called Arthrodire Sandstone Series in Margrethe Valley. Since, as mentioned above, the upper part of the so-called Arthrodire Sandstone Series is probably of Lower Carboniferous age, the Upper Sand-

stone Complex probably also represents part of the continental Carboniferous, comparable to the sediments ascribed by HALLE to the Dinantian (HALLE 1931; below, pp. 71—72).

The subdivision of the Upper Sandstone Complex in a mainly brick-red lower, and a grey upper part, so well displayed in Mt. Celsius and Mt. Stensiö, does not seem to be present in Margrethe Valley, where brick-red and greyish sediments alternate.

The greatest thickness noticed of the Upper Sandstone Complex (always incompletely preserved owing to erosion) is 163 m, in Margrethe Valley.

No fossils have ever been found in the Upper Sandstone Complex.

5. Tables of the East Greenland Devonian.

In addition to the table of the fossiliferous horizons of the East Greenland Upper Devonian inserted above, I here give a table showing the thicknesses noted in the most important areas, and another table showing the regional distribution of the various divisions of the whole East Greenland Devonian and continental Carboniferous, and their relative and absolute age.

Table showing the thicknesses of the subdivisions of the East Greenland Upper Devonian (and possibly Lower Carboniferous) in various localities.

Subdivisions	Mt. Celsius	Margrethe Valley	Mt. Stensiö and surroundings	Remigolepis Ridge and Mt. Sederholm
Upper Sandstone Complex: Grey upper part	40+		27+	..
Upper Sandstone Complex: Red and red-white mottled lower part	20	163+	95	..
Arthrodire Sandstone Series and lowermost grey, probably post-Devonian sandstones: Upper, probably Carboniferous, division	500	12	400	85+
Arthrodire Sandstone Series and lowermost grey, probably post-Devonian sandstones: Arthrodire Sandstone Series *sensu stricto*		182 (194)		
Remigolepis Series: Upper, reddish, division	380	about 107	ab. 730	394
Remigolepis Series: Middle, dark greyish division			ab. 800	200 (670)
Remigolepis Series: Lowermost, dark-red, marly division			71	76
Phyllolepis Series	300+	246+	352+	212+

Table of the Devonian and Continental Carboniferous in East Grenland.

Age		East Greenland	
		Divisions	Localities
Upper Carboniferous	Westphalian	Not found with certainty in East Greenland.	—
	Namurian[1])	Halle Mountains Formation	*Clavering Island:* Halle Mountains. *N. Hudson Land:* Passage Hills. *Traill Island:* Mt. Kongeborgen, upper part.
Lower Carboniferous.	Dinantian	Mt. Pictet Formation	*Hudson Land:* Prospect Valley. ? *Ymer Island:* Easternmost part of Mt. Celsius. (?) *Traill Island:* Mt. Kongeborgen, lower part. ? *Haslum Islands.*
		? *The Upper Sandstone Complex* (light-grey and brick-red sandstones).	*Mt. Celsius:* top of western part. *Gauss Peninsula:* Margrethe Valley; the summits of Mt. Nathorst and Mt. Stensiö.
Upper Devonian	Upper Upper Devonian	3. *Arthrodire Sandstone Series* (grey marls and sandstones with *Grönlandaspis* and Crossopterygians).	*Mt. Celsius:* the uppermost parts. *Gauss Peninsula:* Margrethe Valley; upper parts of Mt. Nathorst, Mt. Wiman, Mt. Stensiö, Mt. Smith Woodward, and the Remigolepis Ridge.
		2. *Remigolepis Series* (dark-red, brown and grey marls, dark-grey sandstones, with constant thin layers; with very rich fossil localities: *Remigolepis*, *Holoptychius* and other Crossopterygians, Stegocephalians (Ichthyostegids), Dipnoans and probably also new groups of Vertebrates; *Bothriolepis* in the lowermost part).	*Mt. Celsius:* the middle parts. *Gauss Peninsula:* S. coast: from Margrethe Valley as far W. as Mt. Smith Woodward; the inland: the base of Mt. Harder; middle part of the Remigolepis Ridge; upper part of Mt. Sederholm, Mt. Bøggild, and the Circus Mountain; N. coast: uppermost parts of Mt. Sederholm; the summit of the E. part of Mt. Victor Madsen. In the W. of Gauss Peninsula consisting of three divisions: c. Red and grey stratified sandstones and marls. b. Dark-grey stratified sandstones and marls. a. Dark-red homogenous marl.

(Continued page 48).

Age		East Greenland	
		Divisions	Localities
Upper Devonian	Upper Upper Devonian	1. *Phyllolepis Series (or Lower Sandstone Complex).* (light-red, brown and light-grey sandstones; with *Phyllolepis*, *Bothriolepis grönlandica*, and *Holoptychius* in several horizons in the upper part; with *Bothiolepis* n. sp. in the middle part).	*Mt. Celsius:* the basal parts. *Gunnar Anderson Peninsula:* Cape Graah. *Gauss Peninsula:* the whole S. coast except Mt. Stensiö; the inland: in the lower parts of most of the mountains: Remigolepis Ridge, the Circus Mountain, Mt. Bøggild, Long Mountain, Mt. Sederholm; the whole W. part of Gauss Peninsula (Watson Plateau, Flett Plateau) W. of Mt. Smith Woodward and Mt. Sederholm, the summit of Mt. Victor Madsen excepted. (?) *Strindberg Peninsula:* grey sandstones, possibly corresponding to the lower part of the *Phyllolepis* Series. (?) *Hudson Land:* grey and reddish sandstones in the Musk-ox Range, possibly belonging to the *Phyllolepis* Series. ? W. parts of *Ymer Island*, S. of Dusén Fjord; *Geographical Society Island*; and *Traill Island:* light-grey and red sandstones possibly belonging to the *Phyllolepis* Series: *Bothriolepis* and Crossopterygians in Mt. Kongeborgen.
	Lower Upper Devonian	Not found in East Greenland.	—
Middle Devonian	Upper Part of Upper Middle Devonian (with *Asterolepis*)	Not found in East Greenland.	—
	Lower Part of Upper Middle Devonian (with *Osteolepis*, *Diplopterax* and *Pterichthyodes*)	Dark sandy shales with *Diplopterax*	Cape Brown district (Wegener Peninsula)[1].
	Lower Middle Devonian	Not found in East Greenland.	—

[1]) See NOE-NYGAARD 1934, SÄVE-SÖDERBERGH 1933a, pp. 95—98.

(Finished page 49).

Age	East Greenland	
	Divisions	Localities
Lower Devonian	Not found in East Greenland.	—
Deposits of uncertain, possibly Devonian, age	"Basal conglomerates"[1]	Musk-ox Fjord; Ella Island; Lyell Land; Åkerblom Island, etc.
	Röde Ö conglomerate[2]	Röde Ö; Hurry Inlet, E. coast, Scoresby Land.[3]
	"Uppermost red Devonian sandstone"	Cape Stosch;[4] Mallemukfjeldet.[5]

[1]) KOCH 1929 a, pp. 67—87; 1929 b, pp. 242—243; KULLING 1930, pp. 334—335; 1931, pp. 4—6; ORVIN 1930, p. 20; SÄVE-SÖDERBERGH 1932 a, p. 28.
[2]) ROSENKRANTZ 1929, p. 139.
[3]) according to verbal information, kindly given by Professor H. BACKLUND.
[4]) KOCH 1931, p. 17; KULLING 1931, pp. 3—5; NIELSEN 1934.
[5]) according to verbal information, kindly given by Dr. KOCH after observations in the summer of 1933.

6. Comparison with other areas.

Now, having established the stratigraphical relations to each other of the faunas in the East Greenland Devonian, we are also able to give a more precise parallelisation with other areas, than was formerly possible. In 1932 (1932 a, pp. 28—37) I was only able to compare the East Greenland Upper Devonian fauna as a whole with the faunas of the other Old Red areas. Now it is evident that the lower part of the East Greenland Upper Devonian, the *Phyllolepis* Series, should be parallelised with the highest Upper Devonian Old Red deposits previously known: those of Bear Island, those of Elgin (Rosebrae Beds), Clashbennie, and Dura Den in Scotland, the Upper Old Red Sandstone of the Bristol District, the beds of Evieux of Belgium, the Chautauquan, and possibly also the Elbert Formation of the United States (cf. SÄVE-SÖDERBERGH 1932 a, pp. 28—37).

Accordingly the *Remigolepis* Series and the Arthrodire Sandstone Series represent the very youngest known part of the Devonian Old Red, and correspond to a gap in the sequence in other areas than East Greenland. The stratigraphical distribution of the genera of *Antiarchi* and of certain other stratigraphically important genera is as shown in the following table.

Age (marine sequence)		Old Red sequence	Typical Old Red-fossils		England-Scotland	Other areas
Upper Upper Devonian	Upper Part	*Remigolepis* Beds	*Remigolepis*		—	Arthrodire Sandstone Series and *Remigolepis* Series in East Greenland (Northern District)
	Lower Part	*Bothriolepis* Beds	*Phyllolepis*	*Holoptychius*	Elgin; Dura Den; Upper Old Red Sandstone of the Bristol district; Clashbennie; Southhall; Pickwell Down Sandstone; Upper Old Red of the Ludlow district; Cheviot Hills	*Phyllolepis* Series in East Greenland (Northern District); Chemung, Catskill, etc. in U.S.A.; Bear Island; Beds of Evieux in Belgium; Victoria, New South Wales, Australia
Lower Upper Devonian			*Bothriolepis*			Senecan in U.S.A.; "Upper Sandstone" of the Baltics and NW. Russia; Siberia
Upper Middle Devonian	Upper Part	*Asterolepis* Beds	*Asterolepis*, *Cypholepis*[1])		Whitemire	Schei'sseriesDh-E, Ellesmere Land; Base of Mashigin Series, Novaya. Zemlya; Timan (Gross 1932, 1933a); Pskow (Gross 1933a)
					Nairn; Bressay in Shetland; uppermost part of the Rousay Flags on the Orkneys ?	Upper part of the "Lower Sandstone" in the Baltics (D.m. 4—5, Gross 1933a) and NW. Russia; Wijde Bay Series in Spitzbergen
			Microbrachius		John o'Groats Sandstone Group; Eday Sandstone	East Greenland, Southern district; Lower part of the "Lower Sandstone" in the Baltics (D.m. 1—2, D.m. 3 ?, Gross 1933a) and NW. Russia
	Lower Part	*Pterichthyodes* Beds	*Pterichthyodes*, *Osteolepis*, *Diplopterax*, *Thursius*		Orcadian (Thurso Group, Rousay Flags, Stromness Flags, Wick flagstone Group etc.)	

[1]) cf. Gross 1932.

IV. REMARKS ON THE TECTONICS OF GAUSS PENINSULA

(Plates 5,9).

The main tectonic features of the investigated part of Gauss Peninsula, as shown in the model, pl. 5, and the map, pl. 9, are not very complicated. The greatest difficulties in the study of the geology of the area are presented by the frequent small faults and slips, and the area of strong disturbance accompanying the important fault-line in Margrethe Valley, which separates the typical Devonian area from the coastal strip with basalt and marine Carboniferous-Mesozoic sediments.

In the parts of Gauss Peninsula W. of Margrethe Valley and Karin Valley we may distinguish between two parts, separated by a fault-line of a certain importance.

The eastern, and smallest, part is formed by Mt. Obrutschew, except its very SW. corner.

The SW. corner of Mt. Obrutschew belongs to the other, the western, part, mainly raised in relation to the eastern part.[1]) The western part includes by far the largest part of Gauss Peninsula, in fact all the parts built up of Devonian rocks, and situated W. of the fault-line which passes through the westernmost parts of Mt. Obrutschew.

However, the fault-line separating the two parts and the flexure in the eastern part do not obscure the earlier continuous gentle folding to which most of the characteristic geological aspect of the peninsula is due.

This folding may be described as a succession of two anticlines and two synclines, probably all with an axial dip of about 3° to the S., and with an axial strike approximately N.—S.

Farthest E. we find the anticline of Mt. Gunnbjørn. The highest parts of this are found in Mt. Gunnbjørn and in the neighbourhood of Mt. Harder. The Mt. Gunnbjørn Anticline builds up i. a. Mt. Obrutschew, Mt. Evans, Mt. Gross, and Mt.Gunnbjørn, the area around Mt. Harder, Mt. Bøggild, and the long ridge W. of Karin Valley, called

[1]) lowered in the S. coast profile of Gauss Peninsula, owing to the flexure in Mt. Obrutschew (cf. pp. 13, 15, 16).

Long Mountain by me. In Margrethe Valley there may be a syncline, as supposed by KOCH (1931), but the disturbance caused by faulting excludes any absolutely certain statements. The fault-line described above as separating the two parts of Gauss Peninsula passes through the Mt. Gunnbjørn Anticline, which is also bounded on the E. by a very important fault-line in Margrethe Valley, as described above (pp. 11—13).

The area of this anticline is bounded on the N.—NE. by fault-lines, from areas made up of older (Mt. Ramsay) or younger (?) sediments (uppermost part of Gästis Valley, continental Carboniferous according to BACKLUND 1932, pl. 2; no fossils mentioned by HALLE 1931).

To the W. the anticline described passes into the Mt. Stensiö Syncline, which has its lowest parts in Mt. Stensiö, Remigolepis Ridge, the middle of Mt. Sederholm, and the E. part of Mt. Victor Madsen. The lateral parts of this syncline also include the Circus Mountain, Mt. Wiman, and Mt. Nathorst, all to the E., and Mt. Smith Woodward and part of Watson Plateau to the W. It is in this syncline that all the large collections of vertebrate fossils were made in 1932 and 1933.

No important faults, but numerous smaller faults, slips, and flexures, were recognised in the Mt. Stensiö Syncline. One of the most important flexures has given rise to the large Bottom Terrace below Mt. Stensiö at Franz Joseph Fjord.

In Mt. Smith Woodward and in the southwestern part of Mt. Sederholm the strata rise to the W., and pass into the Watson Plateau Anticline, with its highest parts slightly W. of the mouth of the W. Parallel Valley, and at the pre-Devonian "inlier", opposite Torbern Bergman Mountain.

This anticline is again followed by a syncline, the Flett Plateau Syncline, comprising the whole westernmost part of Gauss Peninsula (Flett Plateau). — An important flexure is found in the eastern limb of this syncline, as described in the S. coast profile (p. 30).

On the whole the Devonian layers may be said to rise very markedly towards the W. in Gauss Peninsula: the stratigraphically uppermost parts being exposed farthest E., in the Mt. Gunnbjørn Anticline, and the Mt. Stensiö Syncline, whereas in the Watson Plateau Anticline and the Flett Plateau Syncline the stratigraphically lowermost parts rise above the sea level.

The absence of younger sediments above the Devonian and probable continental Carboniferous (Upper Sandstone Complex and upper part of the so-called Arthrodire Sandstone Series) prevents any statement as to the exact age either of the folding or the later faulting. Only the

negative fact that no disconformity has been detected between the uppermost certain Devonian (lower part of the so-called Arthrodire Sandstone Series) and the lowermost probable Carboniferous (upper part of the so-called Arthrodire Sandstone Series) renders it probable that in the area discussed there were no, or at any rate no important, orogenic movements corresponding to the "Bretonische Phase" of STILLE.

A movement, probably comparable to the "Sudetische" or the "Asturische Phase" of STILLE (cf. FREBOLD 1932), is indicated by the occurrence (see above, p. 17) of a pronounced disconformity between the continental probable Lower Carboniferous (Upper Sandstone Complex) and the marine Carboniferous or Permian in Margrethe Valley.

V. CONCLUDING REMARKS

As will be evident from the preceding pages, the stratigraphical investigations in the East Greenland Upper Devonian during the summer of 1933 resulted in the solving of many of the important problems left unsolved by the previous work. All the important faunas found are now stratigraphically correlated; only the position of the horizons with scales of Crossopterygians in Mt. Tegelberget (SÄVE-SÖDERBERGH 1933b, pp. 23, 24) and with such scales and a plate of *Bothriolepis* in the S. part of Mt. Kongeborgen (SÄVE-SÖDERBERGH 1932a, pp. 23—26) remains uncertain.

The most important problems now left concerning the general Devonian stratigraphy of East Greenland are 1) the age and development of the basal layers, — and 2) the position of the boundary between the Devonian and the continental Carboniferous. The former problem will probably be solved by a closer investigation of the shores of the outer part of Musk-ox Fjord, and the latter will probably be solved by fresh, better preserved, material of plant fossils from the upper part of the so-called Arthrodire Sandstone Series. Both of these tasks are planned to be carried out during the summer of 1934.

As to the regional geology of the East Greenland Devonian, large new parts have become satisfactorily known during the summer of 1933. The most important areas left to be investigated in 1934 are: 1) the N. shore of Musk-ox Fjord, and the E. part of its S. shore; 2) the E. part of Strindberg Peninsula; 3) the middle parts of Ymer Island; 4) the W. parts of Geographical Society Island; 5) the W. parts of Traill Island; 6) the area W. of the southern part of King Oskar Fjord; 7) the small areas with "basal conglomerates" on Ella Island, Lyell Land, Åkerblom Island, and farther S; 8) the district with Middle Devonian on Wegener Peninsula.

The area of the "Devon Hills", or Passage Hills, W. of the N. part of Loch Fyne, referred by BACKLUND in 1930 (1930, pp. 268—274) to the Devonian, and subsequently used by him for his type profile,

showing the "Devonian Tidings", finally in 1932 referred by him with hesitation to the Devonian (BACKLUND 1932, p. 114; pls. 1, 2), was investigated by me and my four assistants during six days in 1933 (18/VII—24/VII), before the ice in Franz Joseph Fjord had disappeared. A detailed map was prepared, and good plant fossils were collected in the lowermost division of the sandstone complex exposed here (see the Appendix). These plant fossils prove, beyond every doubt, the Carboniferous (probably Namurian) age of the sediments building up the Passage Hills.

APPENDIX

NOTES ON THE GEOLOGY OF THE PASSAGE HILLS (EAST GREENLAND)

WITH TEXT-FIGURES 14—16 AND PLATES 6, 7, 8, 10.

CONTENTS

	Page
Preface	61
1. Introduction	62
2. Geological observations	63
3. Conclusions	71

PREFACE

The Carboniferous area described in this appendix was investigated in 1933 because it was previously thought to belong to the Devonian.

Apart from the interest connected with the demonstration of the post-Devonian age of the strata discussed, the investigation is also important for the knowledge of the continental Carboniferous of East Greenland. The plant fossils collected in this area are among the best preserved of those hitherto found in the East Greenland Carboniferous, and show the age of the strata sufficiently well for a correlation of these with continental Carboniferous beds of other localities in East Greenland. Hence the study of the local sequence of strata gains in value since it can be used as a basis for comparative petrographical and facial studies.

Thus the greatest interest is connected with the determinations of the plant fossils, for which I wish to thank most sincerely Professor T. HALLE, Stockholm, and the study of the rock-types, to be performed by Dr. D. MALMQVIST. I am greatly indebted to Dr. MALMQVIST for placing at my disposal preliminary determinations of the more important rock-types.

For the drawings (pls. 7,8) I am indebted to Mr. G. FAGRELL, and for further technical assistance to Mrs. M. FERM and Miss B. ARNELL.

A plate showing the best plant fossils (pl. 6) was most kindly prepared for this work by Professor HALLE.

For assistance in the field-work I wish to thank Mr. G. WÄNGSJÖ, Mr. E. OHLSSON, Mr. B. GRANSTRÖM, and my brother, Mr. T. SÄVE-SÖDERBERGH.

1. INTRODUCTION

The area studied is situated W. of the N. half of Loch Fyne, N. of Mt. Nordhoek, E. of the Nørlund Alps and Great Valley and S. of the part of Godthaab Gulf to which descends the Wordie Glacier.

Topographically it consists of a large flat delta plain adjacent to the shore of Loch Fyne and Godthaab Gulf, and W. of this of a N.—S.-directed row of hills, up to 1000 m high, and separated by a large valley occupied by the Circus River, into a southern massif, Plant Hill, and a northern elongated hill, Flexure Hill. Finally, the north-westernmost part of the area is formed by the lowest parts of the slopes leading up to the Nørlund Alps (see the map, pl. 10).

The geology of this area has previously been mentioned by KOCH (1929a, pl. III), who marked the area as Devonian, and in greater detail by BACKLUND (1930, pp. 268—274; 1932, p. 114, pl. 1). In 1930 BACKLUND especially studied some profiles in the S. part of the area, and ascribed the sediments investigated partly to the Upper, partly to the Lower Devonian (1930, pp. 270—271). The profiles were used by him as type profiles, showing the „Devonian Tidings" in East Greenland.

In 1932 BACKLUND was more cautious, and only with hesitation ascribed the strata in question to the Devonian, quoting HALLES determination of badly preserved plant fossils as probably Carboniferous (HALLE 1931, pp. 16—17), and mentioning the petrographical similarity of the sediments to the Carboniferous sediments in Halle Mountains on Clavering Island investigated by D. MALMQUIST (1932).

Our investigations were carried out in six days in the summer of 1933 (18/VII—24/VII), and included a complete topographical mapping, with a fresh triangulation, a measurement of four long profiles, and a study of a few small river sections.

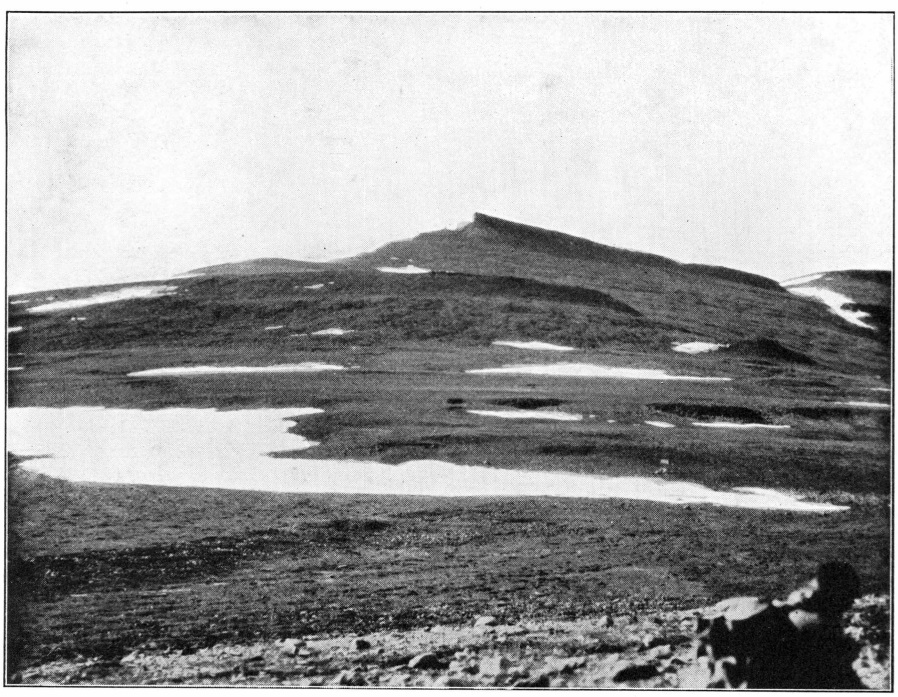
The topographical measurements were carried out with a small Hildebrand theodolite, and several Paulin aneroids of smaller and larger types. A vertical base was used (from point 11 to the camp, point 37), and most of the measurements were carried out from a few points (34,35,37) on the delta plain forming the E.part of the area investigated.

2. GEOLOGICAL OBSERVATIONS

In the description of the geology we shall proceed from S. to N.

The southernmost parts of Plant Hill were investigated in profile No. 1 (see text-fig. 14; the map, pl. 10; cf. pl. 7), which shows the following sequence:

The base, from 235—485 m, is formed of shaly, micaceous, crystalline rocks. Above these there is a terrace at 487 m; and at 491 m a basalt dyke was encountered. The lowest part exposed of the younger sediments is represented by a medium-grained to coarse yellowish-grey sandstone, occurring at 499 m. Above, from 543—655 m, there is



Text-fig. 14. Terraces of mostly greyish continental Carboniferous arkose-sandstones in profile No. 1, below a basalt sill, forming the sharp-edged summit (point 3 on pl. 7 and the map, pl. 10) in the middle of the picture. South-eastern end of Plant Hill, the southern of the Passage Hills. The dark outcrops at the three small snow patches immediately above the largest one are formed by a basalt dyke. Photograph taken on the terrace, marking the boundary between the crystalline and the continental Carboniferous.

a coarse, greyish-green arkose-sandstone. Then follows a terrace at 655 m and another at 678 m. On the last-mentioned terrace a greenish-grey, medium-grained arkose-sandstone with pink felspar is found. The highest terrace is at 702 m, and above it there are grey or reddish-grey, coarse to medium-grained arkose-sandstones, recorded for instance from 840 m (a reddish-grey type). The top of the profile is formed by a thick sill of plagioclase basalt (text-fig. 14). No fossils were found in profile No. 1.

From the southern end of Plant Hill the layers descend to the north and west and are partly traceable in the slope. The basalt sills follow in the main the dip of the sediments in which they are enclosed (see pl. 7).

A long profile, profile No. 2, was investigated partly in the bed of the Red Rose River, which divides Plant Hill into two distinct parts, partly in and above the northern branch of the ravine from which originates the Red Rose River.

Profile No. 2 shows the following strata:

On the top an upper grey, conglomeratic division, from 1009 m (point 11) down to 951 m. The following rock-types were noticed:

1009 m coarse conglomerate, with pebbles embedded in arkose-sandstone, with kaolin;
1008 m light yellow, medium-grained to coarse arkose-sandstone;
997—996 m coarse conglomerate and greenish sandstone;
996—993 m grey, banded, coarse to medium-grained, hard sandstone;
976—974 m, 956—951 m coarse, white arkose-sandstone or conglomerate with kaolin, forming a marked, harder band.

From 951 m down to a terrace at 849 m, the sequence is obscured by débris, but profile No. 3 (see below) shows that a middle brownish-red division occurs here.

Below the terrace at 849 m there is a thin middle grey division, with the following rock-types:

846 m medium-grained, grey arkose-sandstone;
836—835 m medium-grained to coarse, greyish-green sandstone, light yellow on weathering, with coal and stem fragments;
828 m medium-grained, or light yellow, arkose-sandstone.

From 826—707 m there is a lower brownish-red division. Most of this part of the slope is covered by talus of brownish-red, coarse, partly conglomeratic arkose-sandstone with kaolin and partly with round white dots. The same brownish-red arkose-sandstone was observed in situ at 809 m. At 757 m there is a light-red conglomerate, with pebbles 1—2 cm in diameter.

Text-fig. 15. View towards the S. from the top of profile No. 2 (point 11, 1009 m). In the background Mt. Nordhoek to the right (crystalline), Loch Fyne and basalt landscape to the left. In the foreground continental Carboniferous of Plant Hill, the southern of the Passage Hills. The marked, light-coloured bank in the ridge concealing the S. part of Loch Fyne is the conglomeratic hard bank (at 701—685 m in Profile No. 2) of the lower grey division. The terrace in the very foreground formed of the upper grey, conglomeratic, division.

The basal, and largest, part of the profile is formed by a lower grey division, in which the following rock-types were found:

706 m hard, grey arkose-sandstone, partly conglomeratic;
701—685 m hard, topographically well-marked, conglomeratic band, with for instance white coarse sandstone and conglomerate at 686 m and light-red conglomerate with pebbles, 1 cm in diameter, at 685 m;
616—613 m greyish, medium-grained, partly conglomeratic arkose-sandstone;
604 m medium-grained to coarse, grey sandstone;
603 m grey, conglomeratic arkose-sandstone;
601 m grey, stratified arkose-sandstone or conglomerate, with kaolin;
596 m coarse, quartzitic arkose-sandstone with conglomeratic parts;
536—531 m brownish-grey, medium-grained arkose-sandstone, with a conglomeratic band (pebbles 1 cm in diameter) at 533 m;
498 m talus of black shales;
481—471 m greyish, medium-grained arkose, with conglomeratic bands: pebbles up to 1 dm in diameter;
470—458 m white, coarse arkose-sandstone;
434—433 m hard, sandy, dark-grey shales with plants;
432—415 m basalt sill;
414 m greyish-green conglomerate;
413 m coarse, light-coloured sandstone;
411 m medium-grained, grey sandstone;
304—302 m sandstone, rich in biotite, with sandy concretions;
301—296 m medium-grained, greyish-green arkose-sandstone;
289—284 m pink, coarse to medium-grained, cross-bedded arkose-sandstone with dark mica;
265 m light-grey, cross-bedded, medium-grained arkose-sandstone;
263—260 m, 251 m coarse, light-coloured arkose-sandstone;
231—227 m greyish-green, medium-grained arkose-sandstone;
226 m stratified, medium-grained, greyish-green arkose-sandstone;
212—210 m harder bed, consisting of coarse arkose-sandstone with thin bands of coarse conglomerate;
196—195 m, 183—182 m medium-grained, greyish-green arkose-sandstone;
181 m sandstone, very rich in mica;
171—159 m medium-grained, greyish-green arkose-sandstone;
158 m coarse conglomerate.

The dip in profile No. 2 is about 10—15° towards the W.

A good locality for plant fossils was found at 433—434 m in profile No. 2. The material collected here has been determined by Professor HALLE as:

Calamites suckowii BRGN. (pl. 6, figs. 2, 5, 6)
— *haueri* STUR.?
— sp. (pl. 6, fig. 7)
Stigmaria ficoides BRGN.
Cordaites sp. (pl. 6, figs. 1,4)
Lepidodendron sp.
Lepidophyllum sp. (pl. 6, fig. 3)
cf. *Lepidostrobus.*

This flora is of the same type as those from the Halle Mountains on Clavering Island and from the upper part of the profile in Mt. Kongeborgen, previously ascribed with reservation to the Namurian by HALLE (1931, pp. 7—12, 17—22, 24—25). Its Carboniferous age is proved beyond any doubt, and most probably it is really a Namurian flora.

Slightly below the layer with the above-mentioned flora there is another fossiliferous stratum, yielding *Calamites* cf. *suckowii* BRGN. and *Lepidodendron* sp. (determinations by Prof. HALLE).

Profile No. 3 was measured from the top of profile No. 2 (point No. 11, 1009 m) down across the N. part of Plant Hill, N. of the Red Rose River. The following rock-types were noticed:

In the upper grey, conglomeratic division:
907 m medium-grained, light-yellow arkose-sandstone with pink felspar;
900 m medium-grained, shaly sandstone;

in the middle brownish-red division:
885 m light-red arkose-sandstone with kaolin and calcite;
talus for instance at 838 m, coarse to medium-grained brownish-red arkose-sandstone with kaolin.

The same topographically marked bands of conglomerates as in Profile No. 2 were also found in Profile No. 3.

No fossils were found in Profile No. 3.

The Circus River separates Plant Hill from the smaller Flexure Hill. On the S. side of the Circus River several sections through basalt sills were observed in a stratigraphical position comparable to that of the sills described above on top of Profile No. 1.

As shown in pl. 8, the Carboniferous strata dip to the W. from the easternmost parts of Plant Hill.

The very NE. corner of Plant Hill has been lowered by a small fault. In the W. part of Plant Hill the grey conglomeratic division,

Text-fig. 16. View towards the NW. from the top of profile No. 2 (point 11, 1009 m). In the background, the alpine landscape of the Nørlund Alps (crystalline); in the foreground the terraced landscape of Plant Hill (continental Carboniferous: upper grey, conglomeratic division in the nearest terraces, upper brownish-red division above them farther back).

found at the top of profiles No. 2 and No. 3, is overlain by a dark brownish-red division, probably also recognisable W. of the uppermost part of the Circus River. The short time at our disposal prevented a direct investigation of this stratigraphically highest part of the series studied. A flexure or fold is recognisable W. of the very highest parts of the valley of the Circus River (see pl. 8).

The whole Carboniferous landscape shown on pl. 8 and text-figs. 15, 16 is very characteristic, with gentle slopes and more marked terraces. It forms a sharp contrast to the alpine landscape, made up of gneisses etc., in the Nørlund Alps.

In the small Flexure Hill profiles No. 4 and No. 5 were measured, but these profiles are rather incomplete, partly owing to the large amount of débris, partly to the intricate tectonics of the area. In fact the whole Flexure Hill forms part of an area of strong disturbance, connected with an important fault-line, separating the sedimentary area studied from the crystalline of the Nørlund Alps. The disturbance is especially visible in the highest and N. parts of Flexure Hill, where the strata have a most variable dip.

An important flexure, striking N.—S., was recognised near the top of Flexure Hill. In the E. part of this the strata have a dip of 25° towards the W., in its W. part they dip about 30° towards the E., whereas the normal dip in the lower, eastern, undisturbed part of Flexure Hill is about 15° W.

In Profile No. 4, from the Circus River to the top of Flexure Hill (point 18) the following rock-types were found:

790—660 m mainly greyish sandstones and conglomerates:
782 m layer with concretions, weathered out on the surface;
750 m grey conglomerate, dipping 30° E.;
719 m terrace and fold, striking N.—S.;
718 m grey conglomerate, dipping 25° W;
660—583 m mainly talus of coarse, light-brownish-red arkose-sandstone and conglomerates, with kaolin, partly with white spots, also
648 m coarse conglomerate with greenish pebbles;
446 m and 417 m, hard bands of conglomeratic sandstones;
about 262—258 m basalt sill;
257 m dark, marly, shaly sandstone with mica;
256—253 m dark, sandy shales;
153 m white, medium-grained to coarse sandstone.

Profile No. 5, from the top of Flexure Hill down towards the SE., shows the following sequence:

759 m medium-grained, greyish-yellow, micaceous sandstone;
608—560 m coarse to medium-grained, mainly brownish-red arkose-sandstones, with kaolin and calcite, observed in situ for instance at 608 and 607 m;
559—530 m stratified greyish-green sandstone.

The northernmost part of the area of continental Carboniferous studied is formed of a strip of sediments extending along the eastern border of the Nørlund Alps, between the latter and the delta plain forming the S. coast of the westernmost part of Godthaab Gulf.

The sediments found here all seem to belong probably to the lower grey division, forming the basis of profiles Nos. 2 and 3. The following small profiles, or parts of profiles, were measured:

1) In the Arkose River:
229 m yellowish-grey, conglomeratic arkose-sandstone, with mud-cakes, dipping 20° SW.;
191—166 m mainly greyish sandstones and conglomerates:
191 m white, medium-grained sandstone with dark mica;
171 m light-coloured conglomerate, with pebbles up to 1 dm in diameter;
166 m coarse to medium-grained, light reddish-grey sandstone;

2) In the Unnamed River:
216—191 m mainly greyish sandstones, with
216 m very coarse, light-coloured sandstone;
196 m reddish brown, cross-bedded conglomerate with kaolin.

3) In the Surprise River:
148—118 m bands of hard, grey sandstone, alternating with bands of very loose, green-dotted, brownish marls; also cross-bedded bands with large charred stem fragments;
117 m conglomerate;
115 m sandstone with brownish dots;
108 m brownish sandstone with sandy concentrically stratified concretions.

An unimportant small part, possibly of the same grey series, is found at the shore of Loch Fyne, S. of Red Rose River (not figured on the map, pl. 10). Here indeterminable, charred plant fossils were also encountered.

Below point 34 there are sediments of a more peculiar type, possibly belonging to the Eleonore Bay Formation.

3. CONCLUSIONS

The preceding description shows that the area investigated is built up of a series of sediments with a uniform dip of about 11° mainly towards the W. Both to the S. and W. it is separated by important fault-lines from areas built up of crystalline rocks or the Pre-Cambrian sedimentary Eleonore Bay Formation (Mt. Nordhoek to the S., Nørlund Alps to the W.). In the southernmost part the sediments investigated are stated to rest upon crystalline rocks, whereas in the NW. there is an area of strong disturbance connected with the fault-line.

The sediments investigated are subdivided locally into six divisions, a thick lower grey, a thick lower brownish-red, a thin middle grey, a thick middle brownish-red, a conglomeratic grey, and an upper, dark brownish-red division.

The age of the lowermost division is proved by the finding of in part fairly well preserved plant fossils to be Carboniferous, most probably Namurian. For the present there is no reason to assume another age for the higher divisions, but this question must, of coarse, be left for further investigations.

A comparison with the neighbouring areas is possible owing to the fixing of the age by the plant fossils. Contemporaneous deposits are found in Halle Mountains on Clavering Island (Malmqvist 1932), and in the upper part of Mt. Kongeborgen on Traill Island (Halle 1931, pp. 7—12, 24—25).

Our present knowledge of the distribution of the various divisions of continental Carboniferous in East Greenland has been summarized above in a table together with the table of the East Greenland Devonian (p. 47).

It might be of interest to add here a table showing the distribution of the various plant fossils recorded by Halle from the continental Carboniferous. In the beds on top of the certain Devonian and probably referable to the Carboniferous there have only been found stem fragments, determined by Professor Halle as *Knorria* sp. (cf. above, pp. 44—45). Of the ten species enumerated from the Namurian, three

have hitherto only been found in the newly discovered flora of the Passage Hills, viz. *Stigmaria ficoides* BRGN, *Lepidophyllum* sp., and cf. *Lepidostrobus*.

At least nine or ten species are found in the Dinantian, and Dinantian or Namurian, and ten in the Namurian.

Age	Dinantian		Dinantian or Namurian		Namurian (with reservation)		
Localities	Prospect Valley	Mt. Kongeborgen (Dinant?)	Haslum Islands	Mt. Celsius, easternmost part	Halle Mountains	Passage Hills	Mt. Kongeborgen
Asterocalamites ? sp.	+	?	—	—	—	—	—
cf. *Asterocalamites scrobiculatus* (SCHLOTH) ZEILL	—	+	—	—	—	—	—
Calamites spp.	—	?	—	—	—	+	+
Calamites suckowii BRGN	—	—	—	—	(+)	+	+
Calamites haueri STUR	—	—	—	—	+	?	—
Telangium bifidum (LINDL. & HUTT.) BENSON	+	—	—	—	—	—	—
Adiantites cf. *bellidulus* HR.	+	—	—	—	—	—	—
Rachis of Fern or Pteridosperm.	+	—	—	—	—	—	—
Lepidodendron sp. (cf. *L. fallax* NATH.)	—	+	—	—	—	—	—
Lepidodendron sp. (cf. *L. veltheimii* STERNB.)	—	—	—	—	+	—	—
Lepidodendron spp.	—	—	+	+	+	+	—
Lepidophyllum spp.	+	—	—	—	—	+	—
cf. *Lepidostrobus*	—	—	—	—	—	+	—
Stigmaria ficoides BRGN	+	+	—	+	—	+	—
Sigillaria sp.	—	—	—	—	—	—	+
Cordaites sp.	—	—	—	—	+	+	—
Number of species...	6	4	1	2	5	8	3

+ present; (+) this, or a related form present; — not stated.

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PLATES

Plate 1.

Fig. 1. View towards the interior of Margrethe Valley from the Western Plateau. To the left Devonian and probably also continental Lower Carboniferous strata of Mt. Obrutschew, bounded on the right by an important fault-line (cf. pp. 11—13), to the right the basalt and marine Mesozoic sediments of the coastal strip. In the foreground basalt.

P. S. b., *P. S. g*, *Phyllolepis* Series (Lower Sandstone Complex): *P. S. b*, mainly dark-brown part; *P. S. g*, light grey or white part; *R. S*, *Remigolepis* Series; *A. S. l*, *A. S. u*, Arthrodire Sandstone Series: *A. S. l*, lower, marly part; *A. S. u*, upper, sandy part; *U. C*, upper Sandstone Complex.

Fig. 2. Part of the S. coast section of Gauss Peninsula, from Margrethe Valley to Mt. Gunnbjørn, seen from the S., from the shore of Franz Joseph Fjord below the SW. corner of Mt. Obrutschew. E. limb of the Mt. Gunnbjørn Anticline. In the foreground down-slid part of the *Remigolepis* Series, bounded by Koch's F_1.

B, *G*, *Phyllolepis* Series (Lower Sandstone Complex): *B*, mainly dark-brown part; *G*, light grey or white part; *R*, *Remigolepis* Series.

Photographs taken with the Zeiss Ikon Nixe Apparatus, on Agfa Isochrome Film, with a Zeiss Yellow Filter Helt ($\times$ $1^1/_2$—2).

Fig. 1

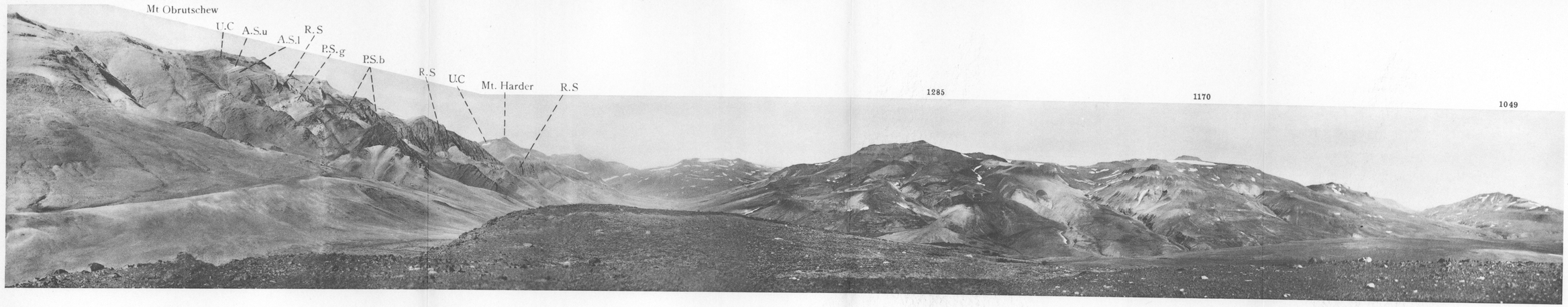

Mt Obrutschew
U.C
A.S.u
A.S.l
R.S
P.S.g
P.S.b
R.S
U.C
Mt. Harder
R.S
1285
1170
1049

Fig. 2

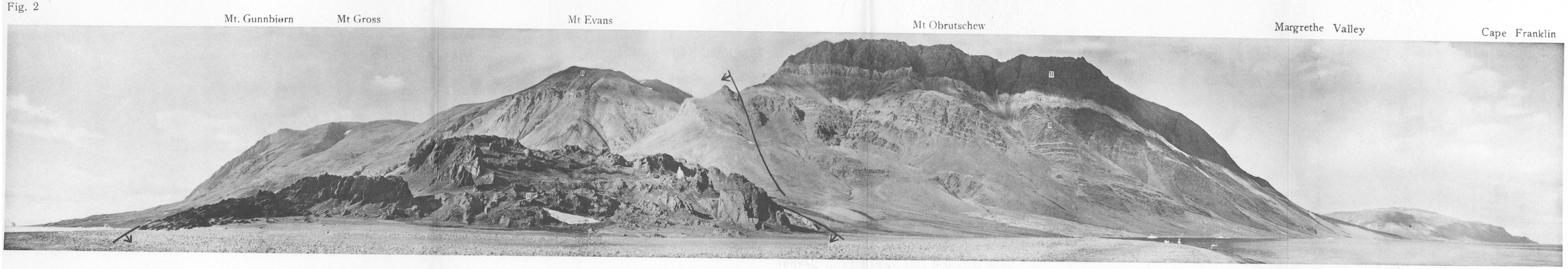

Mt. Gunnbiørn
Mt Gross
Mt Evans
Mt Obrutschew
Margrethe Valley
Cape Franklin

Plate 2.

Fig. 1. Mt. Nathorst and surroundings in the E. limb of the Mt. Stensiö Syncline, seen from the S., from the shore of Franz Joseph Fjord (cf. the map, pl. 9). Of the two broken lines, the lower one represents the boundary between (*P*) the *Phyllolepis* Series (Lower Sandstone Complex) and the *Remigolepis* Series (R_1, R_2), the upper one the boundary between the lowermost part (R_1) of the *Remigolepis* Series (with dark-red or chocolate-brown marls) and the overlying dark-grey part of the series (R_2). —o—, richly fossiliferous horizons, the left one at 289 m, with *Remigolepis* cf. *tuberculata* Stensiö and Crossopterygians, the right one at 372 m, with *Bothriolepis* and the new group of *Choanata* (cf. pp. 23—24); o, richly fossiliferous talus from the horizon at 372 m.

Fig. 2. The W. part of Mt. Smith Woodward, seen from the SW., with various local divisions of the *Phyllolepis* Series (Lower Sandstone Complex): *2*, brown division; *3*, light yellow division, white at the top; *4*, striped reddish-brown and light yellowish division; *5*, striped blackish-brown and light grey division.

Photographs taken with the Zeiss Ikon Nixe apparatus, on Agfa Isochrome Film, with a Zeiss Yellow Filter Hell (× $1^1/_2$—2).

Fig. 1

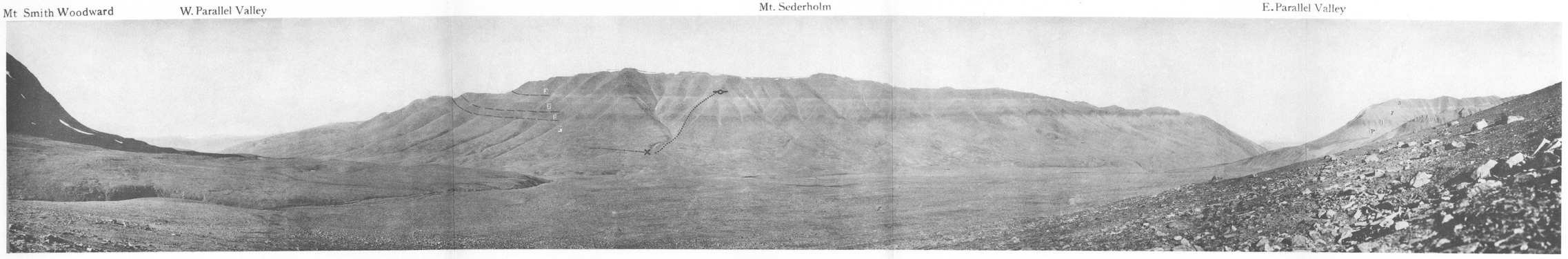


Fig. 2

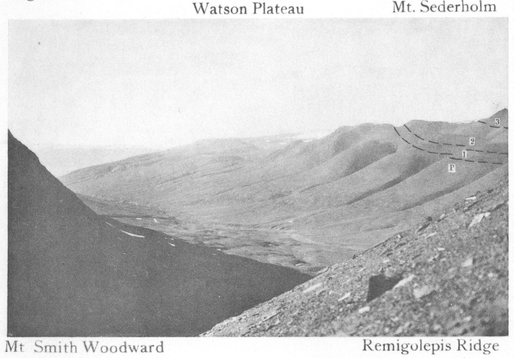


Fig. 3

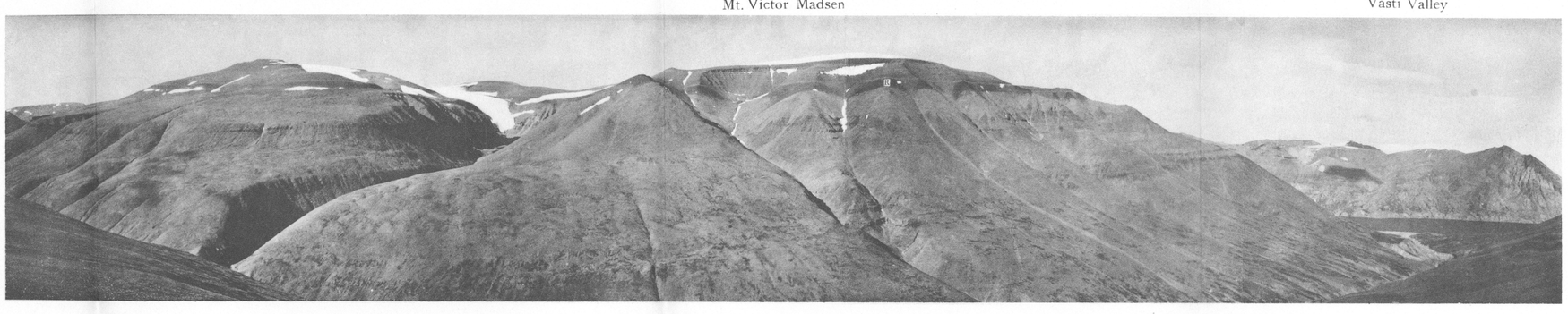


Plate 3.

Fig. 1. Mt. Sederholm, and the SW. corner of the Circus Mountain, seen from the S., from the slope below Remigolepis Ridge (cf. the map, pl. 9). The bottom of the Mt. Stensiö Syncline passes through the middle of the panorama. The Circus Mountain is seen to the right of the E. Parallel Valley.

Fig. 2. Watson Plateau and Mt. Sederholm seen from the SE., from the top of Remigolepis Ridge. In the foreground the W. Parallel Valley.

Fig. 3. The E. part of Mt. Victor Madsen, seen from the N. slope of Mt. Sederholm. Central part of the Mt. Stensiö Syncline, in direct northward continuation of fig. 1. Musk-ox Fjord seen to the right, at the mouth of Vasti Valley (cf. the map, pl. 9).

P, *Phyllolepis* Series; *R*, *1*, *2*, *3*, Remigolepis Series: *R*, *1*, lower, dark-red division; *2*, middle, dark-grey division; *3*, upper, reddish division; — . — . —, horizon at about 541 m with *Phyllolepis* and *Bothriolepis;* X, the richest locality with *Phyllolepis* and *Bothriolepis*; . . . . . , the profile in the Profile Ravine; —o— horizons with *Remigolepis* (ornamentation of the *incisa-* and *acuta*-type) at 1105—1120 m.

Photographs taken mostly with the Zeiss Ikon Nixe apparatus, on Agfa Isochrome Film, with a Zeiss Yellow Filter Hell (X $1^1/_2$—2). Fig. 3 taken by G. Wängsjö, the others by the writer.

Fig. 1

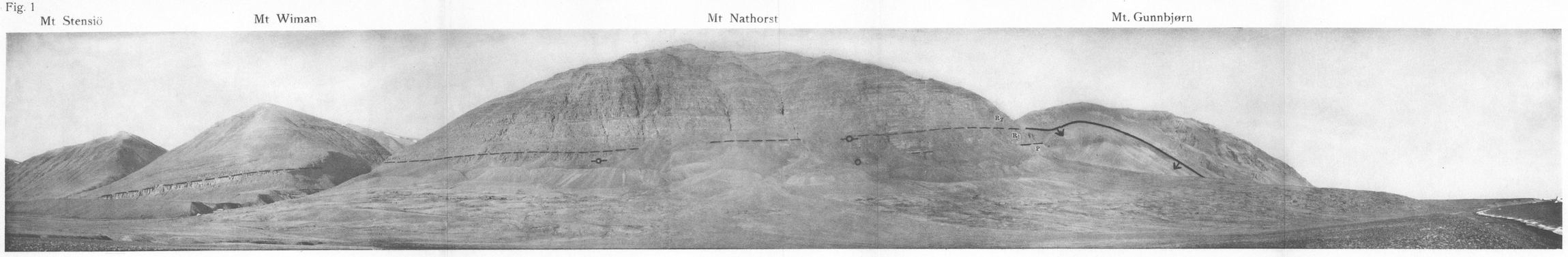

Mt Stensiö
Mt Wiman
Mt Nathorst
Mt. Gunnbjørn
R2
R1
F

Fig. 2

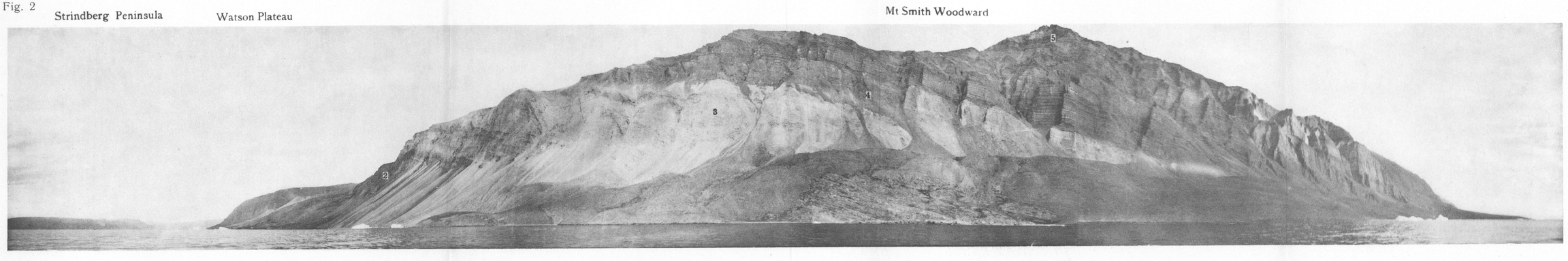

Strindberg Peninsula
Watson Plateau
Mt Smith Woodward
2
3
4
5

Plate 4.

Fig. 1. View towards the NE. and E. from the top of the profile in Remigolepis Ridge (1407 m), showing strata, belonging to the E. limb of the Mt. Stensiö Syncline and the W. half of the Mt. Gunnbjørn Anticline. Compare the model, pl. 5, and the map, pl. 9.

Fig. 2. View towards the E., SE., S., and SW., from the *Remigolepis* horizon (1105 m) at the Profile Ravine in Mt. Sederholm. Strata belonging to the Mt. Stensiö Syncline. Compare the model, pl. 5, and the map, pl. 9.

Drawings by G. FAGRELL after photographic panoramas taken with the Zeiss Ikon Nixe apparatus, on Agfa Isochrome Film, with a Zeiss Yellow Filter Hell (X $1^1/_2$—2).

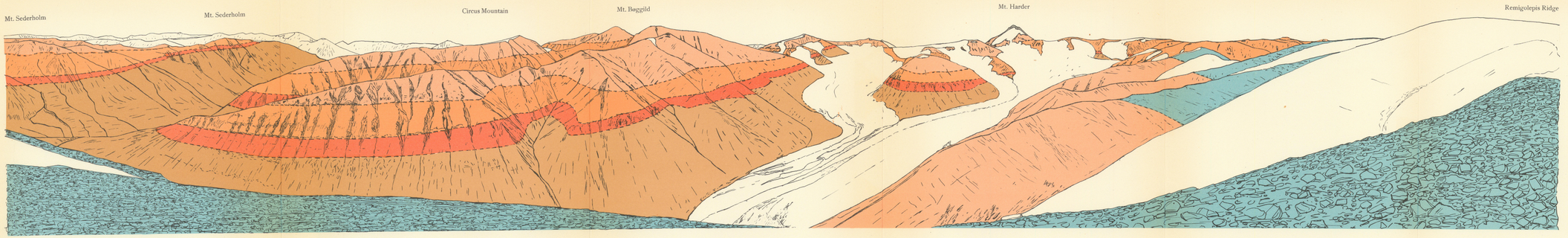


Fig. 1

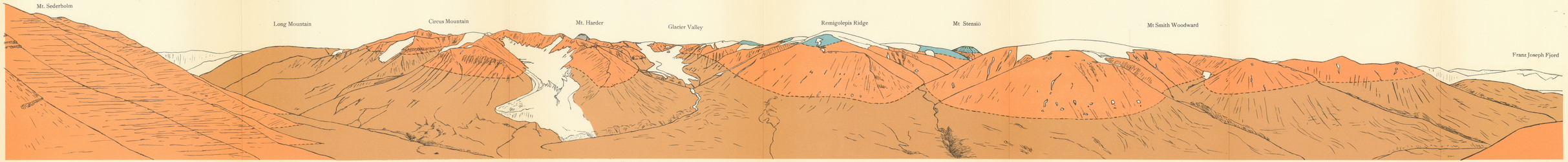


Fig. 2

Explanation of geological signs and colours

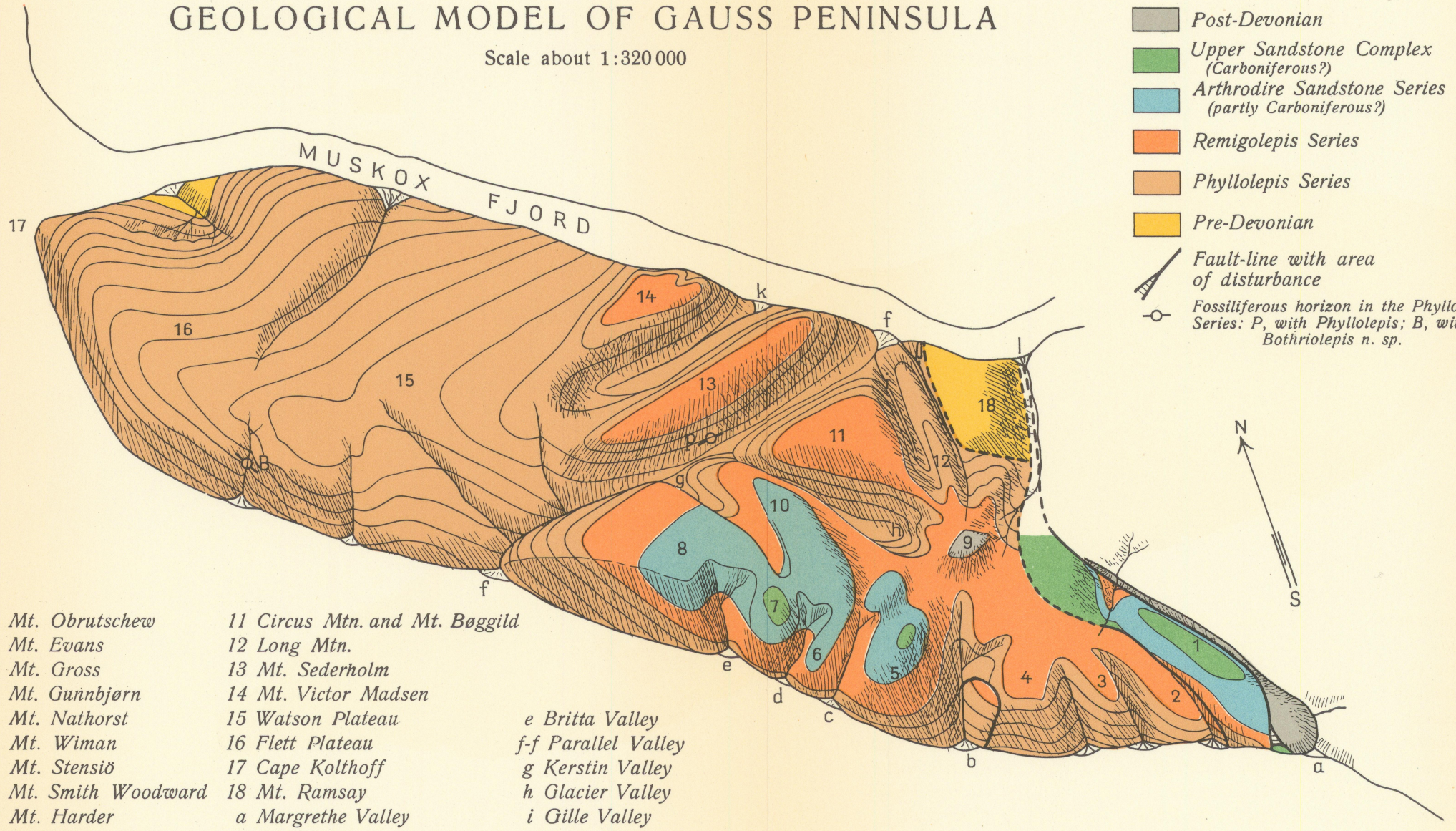
- *Probably Post-Devonian*
- *Upper Sandstone Complex (Carboniferous?)*
- *Arthrodire Sandstone Series (partly Carboniferous?)*
- *Remigolepis Series*
- *Remigolepis Series: Upper, Reddish Division*
- *Remigolepis Series: Middle, Dark-grey Division*
- *Remigolepis Series: Lower, Dark-red Division*
- *Phyllolepis Series*
- *Fossiliferous horizon*

Plate 5.

Model, showing the main geological features of the Devonian parts of Gauss Peninsula. Drawn chiefly after a rough model in plasteline and wax. The topography shown by shading only, the continuous lines (strato-isohypses) showing the position of the strata.

GEOLOGICAL MODEL OF GAUSS PENINSULA

Scale about 1:320 000



Post-Devonian

Upper Sandstone Complex (Carboniferous?)

Arthrodire Sandstone Series (partly Carboniferous?)

Remigolepis Series

Phyllolepis Series

Pre-Devonian

Fault-line with area of disturbance

Fossiliferous horizon in the Phyllolepis Series: P, with Phyllolepis; B, with Bothriolepis n. sp.

1 Mt. Obrutschew
2 Mt. Evans
3 Mt. Gross
4 Mt. Gunnbjørn
5 Mt. Nathorst
6 Mt. Wiman
7 Mt. Stensiö
8 Mt. Smith Woodward
9 Mt. Harder
10 Remigolepis Ridge
11 Circus Mtn. and Mt. Bøggild
12 Long Mtn.
13 Mt. Sederholm
14 Mt. Victor Madsen
15 Watson Plateau
16 Flett Plateau
17 Cape Kolthoff
18 Mt. Ramsay
a Margrethe Valley
b Agda Valley
c Elsa Valley
d Aina Valley
e Britta Valley
f-f Parallel Valley
g Kerstin Valley
h Glacier Valley
i Gille Valley
j Karin Valley
k Vasti Valley
l Gästis Valley

Plate 6.

Fossil plants from the locality at 433—434 m in profile No. 2 in Plant Hill (Passage Hills). All, except fig. 1, natural size, photographed dry with a Zeiss Tessar objective 1 : 6.3, F. 36 cm, on Ilford Special Rapid Panchromatic plates. Fig. 1, $^4/_1$ natural size, photographed dry with a Zeiss Tessar objective 1 : 6.3, F. 25 cm, also on Ilford Special Rapid Panchromatic plates.

Fig. 1. *Cordaites* sp. Same specimen as in fig. 4, enlarged $^4/_1$.
Fig. 2. *Calamites suckowii* BRGN. Impression of stem fragment.
Fig. 3. *Lepidophyllum* sp. Sporophyll.
Fig. 4. *Cordaites* sp.
Fig. 5. *Calamites suckowii* BRGN. Impression of stem fragment.
Fig. 6. *Calamites suckowii* BRGN. Cast of stem fragment.
Fig. 7. *Calamites* sp.

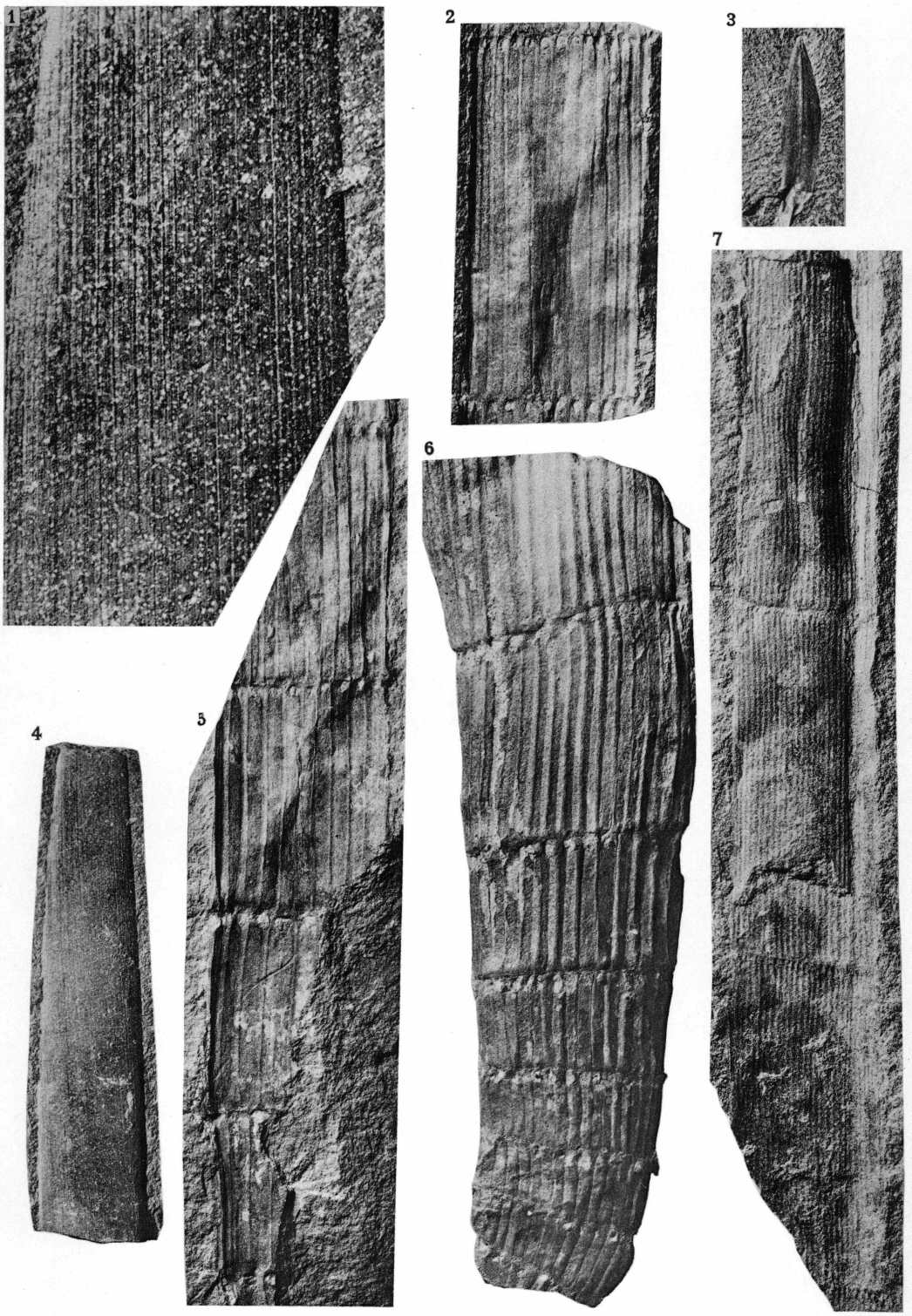

1
2
3
4
5
6
7

Plate 7.

The Passage Hills area seen from the E., from point 37 on the map, pl. 10. The S. half (above) showing very gently dipping continental Carboniferous beds, resting on crystalline at point 2, and intruded by several basalt sills. The N. half (below) showing the fault-line between the continental Carboniferous of the Passage Hills and the crystalline of the Nørlund Alps; and Flexure Hill, with highly disturbed Carboniferous beds. For the identification of the numbered points compare pl. 8, and the map, pl. 10.

Drawing by G. FAGRELL after a photographic panorama, taken with the Zeiss-Ikon Nixe apparatus, on Ilford Soft Gradation Panchromatic Plates, with an Ilford Gamma Filter, and a Zeiss Distar Lens 2.5 × 42.

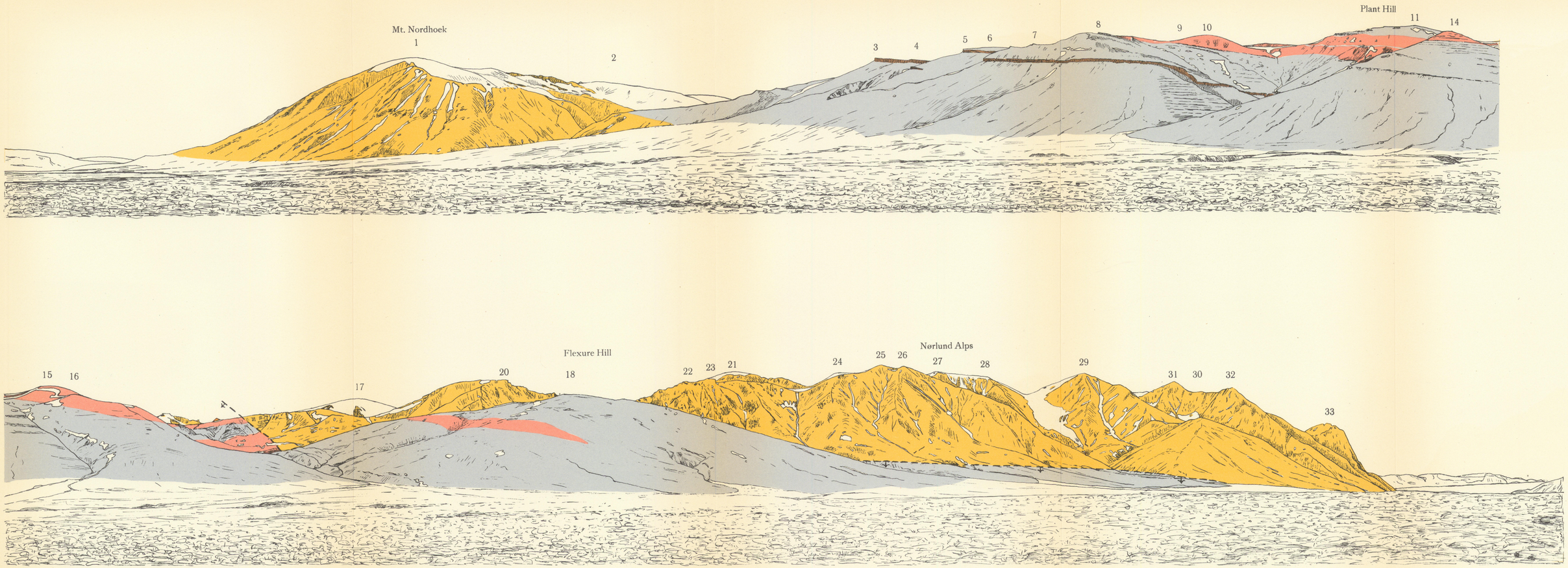
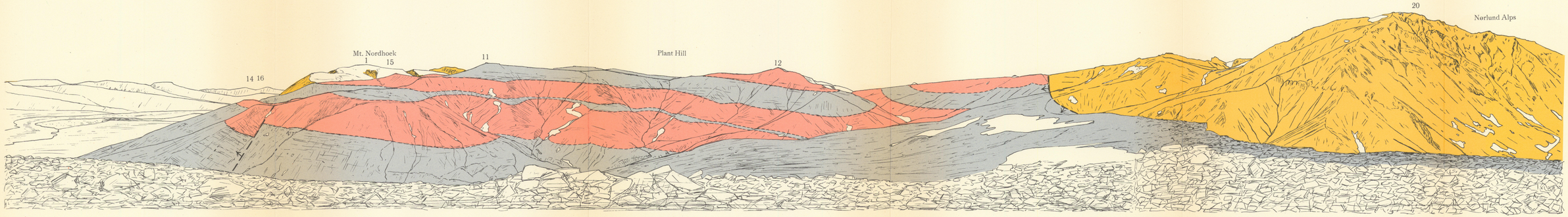

Mt. Nordhoek
Plant Hill
Flexure Hill
Nørlund Alps
1
2
3
4
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11
14
15
16
17
18
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28
29
30
31
32
33
Pre-Carboniferous (Crystalline)
Mainly Grey Continental Carboniferous
Mainly Reddish Continental Carboniferous
Basalt
Fault-line
Horizon with well-preserved fossil plants

Plate 8.

View from Flexure Hill (the northern of the Passage Hills) towards the S., showing the gently dipping, practically undisturbed continental Carboniferous in Plant Hill, and the boundary (fault) between the continental Carboniferous of the Passage Hills and the crystalline of the Nørlund Alps.

For the identification of the numbered points compare pl. 7, and the map, pl. 10.

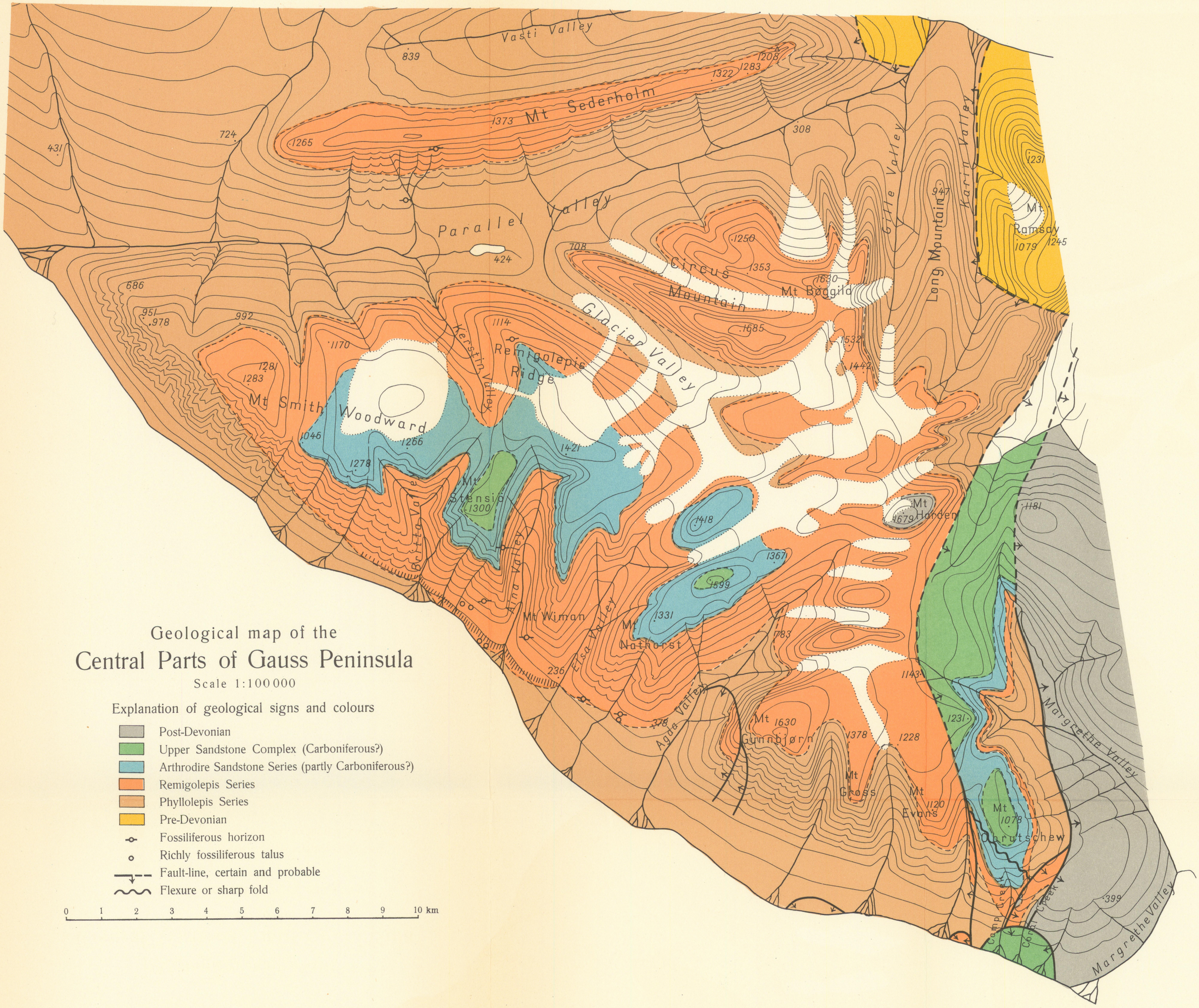
Drawing by G. FAGRELL, after a photographic panorama, taken with the Zeiss-Ikon Nixe apparatus, on Agfa Isochrome Film, with a Zeiss Yellow Filter Hell (X $1^1/_2$—2).



Pre-Carboniferous (Crystalline) — *Mainly Grey Continental Carboniferous* — *Mainly Reddish Continental Carboniferous* — *Basalt* — *Fault-line*

Plate 9.

Geological map of the central parts of Gauss Peninsula. Geological features mostly after own direct field-observations; but in Mt. Ramsay and surroundings mainly after BACKLUND (1932); and in certain parts to the N. and S. of Mt. Harder after photographs taken from aeroplane by the mappers of the Danish East Greenland Expedition.



Geological map of the Central Parts of Gauss Peninsula

Scale 1:100 000

Explanation of geological signs and colours

- Post-Devonian
- Upper Sandstone Complex (Carboniferous?)
- Arthrodire Sandstone Series (partly Carboniferous?)
- Remigolepis Series
- Phyllolepis Series
- Pre-Devonian
- Fossiliferous horizon
- Richly fossiliferous talus
- Fault-line, certain and probable
- Flexure or sharp fold

0 1 2 3 4 5 6 7 8 9 10 km

Plate 10.

Geological map of the Passage Hills and surroundings. Triangulation, topography, and geology by the writer, except in the inner parts of the valley between Mt. Nordhoek and Plant Hill. Since a very accurate map of the whole working-area of the Expedition is to be published later by the Geodetic Institute, Copenhagen, I have thought it more appropriate not to give any preliminary determinations of the exact altitudes of the points used, which have thus only been numbered for the purpose of identification in the description and in the other plates (pls. 7, 8).

Geological map of the Passage Hills

Scale 1:100000

