Excursion 1

Introductory Field Trip in the Central Part of the Oslo Rift (the Surroundings of Oslo)

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The excursion, which goes from the western to the eastern boundary of the Oslo Region, will give a general review of the main geological features of the Oslo Area. These include (from the base): the Precambrian gneisses unaffected by the Caledonian orogeny, the Lower Palaeozoic sediments (Cambro–Silurian limestones and shales ending up with Upper Silurian continental sandstone) folded in Caledonian times, Permian sediments and lavas, Permian intrusives, the cauldrons and Permian faults — all partly covered by Quaternary marine clay and moraines. The reader is referred to the introductory articles in Part I.

To present the items in a geologically correct sequence is difficult, but the simplified map (Fig. 1) should help to place the nine excursion stops in their correct geological environment.

Road log (Excursion 1)

From Sundvollen southward along Holsfjorden (the southeastern branch of Tyrifjorden) we descend stratigraphically from the Upper Silurian red and grey continental sandstone (the Ringerike Group) which forms broad synclines, into the underlying folded Cambro-Silurian marine shales and limestones (stops 1 & 2). The sub-Permian peneplain which cuts both the Ringerike Sandstone and the Cambro-Silurian shales and limestones, is overlain by Permian sediments and lavas. (See also Larsen, this volume, Fig. 1, p. 144).

1. Somewhere near 'Skaret', at the fork between the roads E68 and 285 (where exactly will depend on how far they have progressed with the new roadcuts) we will stop to look at the lowermost Permian lavas, i.e. the basalt B_1 overlain by rhomb-porphyry lava RP_1. If possible (at Sønsterud?) the relationships to the underlying folded Silurian beds will also be shown. The whole sequence is cut by a series of Permian faults, with a dominant N-S direction.
2. Ringerike Sandstone, in the core of a wide syncline 16 km south of 'Skaret'. A variety of sedimentary structures may be seen in this 1250m-thick sequence formed in a meandering fluviatile environment, probably on a

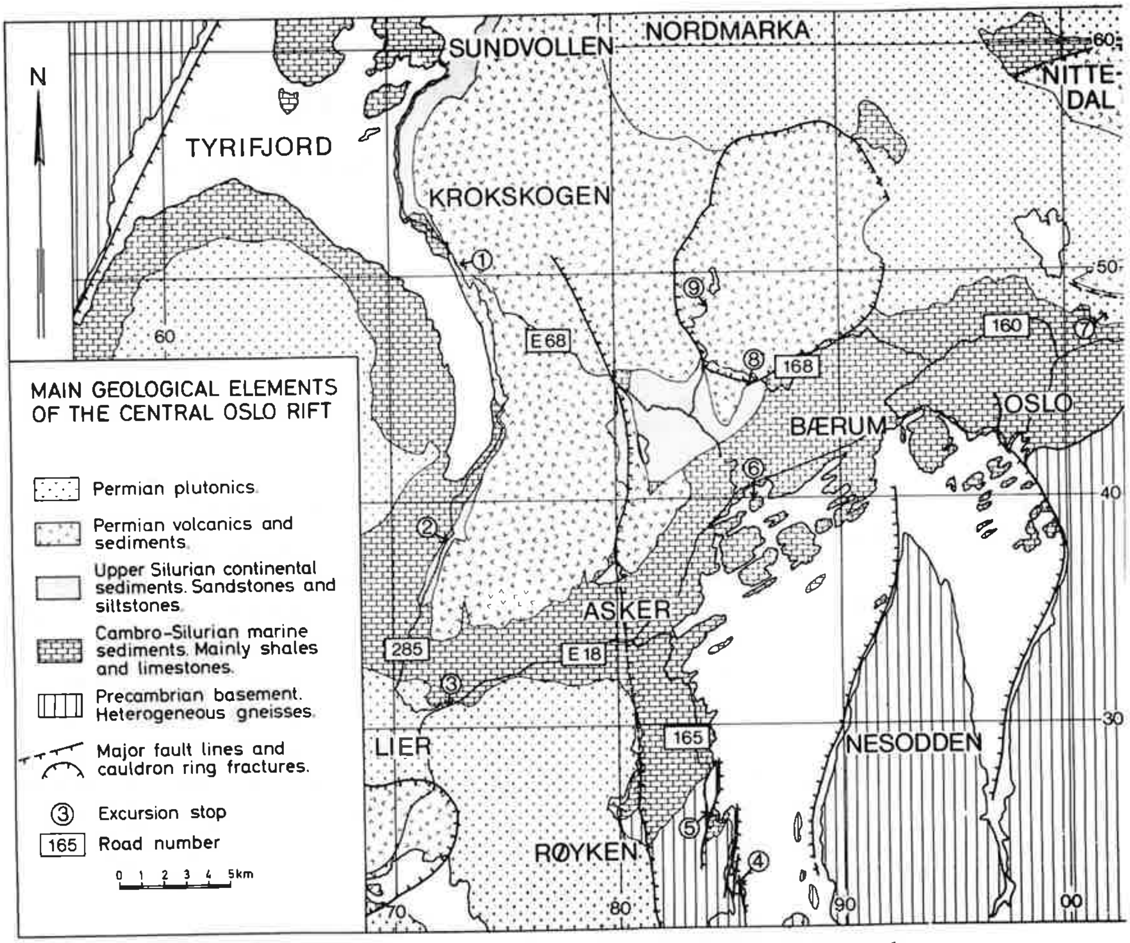

Fig. 1. The main geological elements of the Oslo Rift, with the UTM-grid superimposed.

coastal alluvial plain. The Caledonian deformation (the folding) has been very weak here (Turner 1974).

Southward on road 285 along the Lier valley it is possible to observe several terminal moraines formed during the deglaciation about 10.000 years ago.

3. It is not necessary to stop the bus to note the abrupt change in rock-types east of Tranby where a connecting road from 285 joins E18. We meet here the Permian Drammen granite, a normal red biotite granite cut by Permian (or younger) diabases. The intrusive contact of the granite into the grey Silurian limestone is passed just northeast of locality 3. The granite has not displaced its wallrock, and no change in the trend of fold axes is observed.

The major E18 road northeastwards, follows approximately the strike of fairly open folds in Silurian limestone and shale. Several cross-cutting dikes, some of them related to the granite, are seen in road-cuts on the left near a small lake. East of Asker we turn southward along the Oslofjord and drive across the axial trend of the Caledonian folds. The boundary Cambrian/Precambrian is passed at Slemmestad just north of stop 5. (Slemmestad Cement factory originally used the local Lower Ordovician limestone, but now Silurian limestone is brought in by boat.)

4. To reach this locality (Høvikvollen) near the eastern side of the Oslo graben the road winds across quite a number of fault 'lamellae', each containing the boundary Cambrian/Precambrian. At stop 4 the sub-Cambrian peneplain is marked by a thin cover of Cambrian conglomerate on a weathered Precambrian gneissic basement. (No hammering). The fault scarp at Nesodden (the Oslofjord master fault) is seen across the fjord to the east. The relative movement of fault lamellae is indicated on the map Fig. 1. (Gleditsch 1944, 1952, Spjeldnæs 1955).

5. Road-sections between Nærsnes and Slemmestad show repeated brecciation along one of the many N-S trending faults, which are part of a synthetic fault pattern. The distance between each step fault is approximately one km.

   On the way northwards to the suburb Sandvika the excursion climbs upwards in the stratigraphy from Slemmestad, known for its numerous and well-preserved Cambrian and Lower Ordovician fossils (especially graptolites and trilobites), and crosses the boundary between Upper Ordovician (Ashgillian) and Lower Silurian (Lower Llandoverian) which is marked by a sandstone (5b) (and locally conglomerate). This important break may represent either a period of weak folding heralding the Caledonian orogeny or faulting introducing an early depression.

   The Cambro-Silurian sequence in the Oslo Region is divided into 10 stages, each one divided in substages. Stage 1–2d is Cambrian, 2e–5a is Ordovician, 5b–10 is Silurian. On the way to Sandvika one reaches stage 7a–c, the Pentamerus Series (Upper Llandoverian), and then descends gradually again into the Ordovician, 4c–5a.

6. Shore-sections at the island Kalvøya just outside Sandvika. The folded Ordovician sediments are composed of nodular limestone, limestone beds and shales and are crossed by numerous Permian diabase dikes. The 5b conglomerate is seen at the NE side of the island (Kiær 1908).

   To reach the next stop, which is on one of the hills bordering the city of Oslo to the NE, the excursion must cross through the city. At the harbour (near the city hall and the castle Akershus) the Cambrian alum shale and the underlying Precambrian gneisses are exposed. To the east at the fault escarpment of Ekeberg, potash, alum and a red paint were produced from the alum shale in the period 1737–1815.

7. Abandoned quarry, north of Stig, now a parking place. The Grefsenåsen (Grefsenkollen) hill to the east contains the normal sequence: folded Cambro-Silurian sediments, Permian sediments, Permian lavas (basalt B_1 and rhomb porphyry RP_1). These rocks form the roof of the Permian nordmarkite (syenite) which intruded the southern boundary of the Nittedal

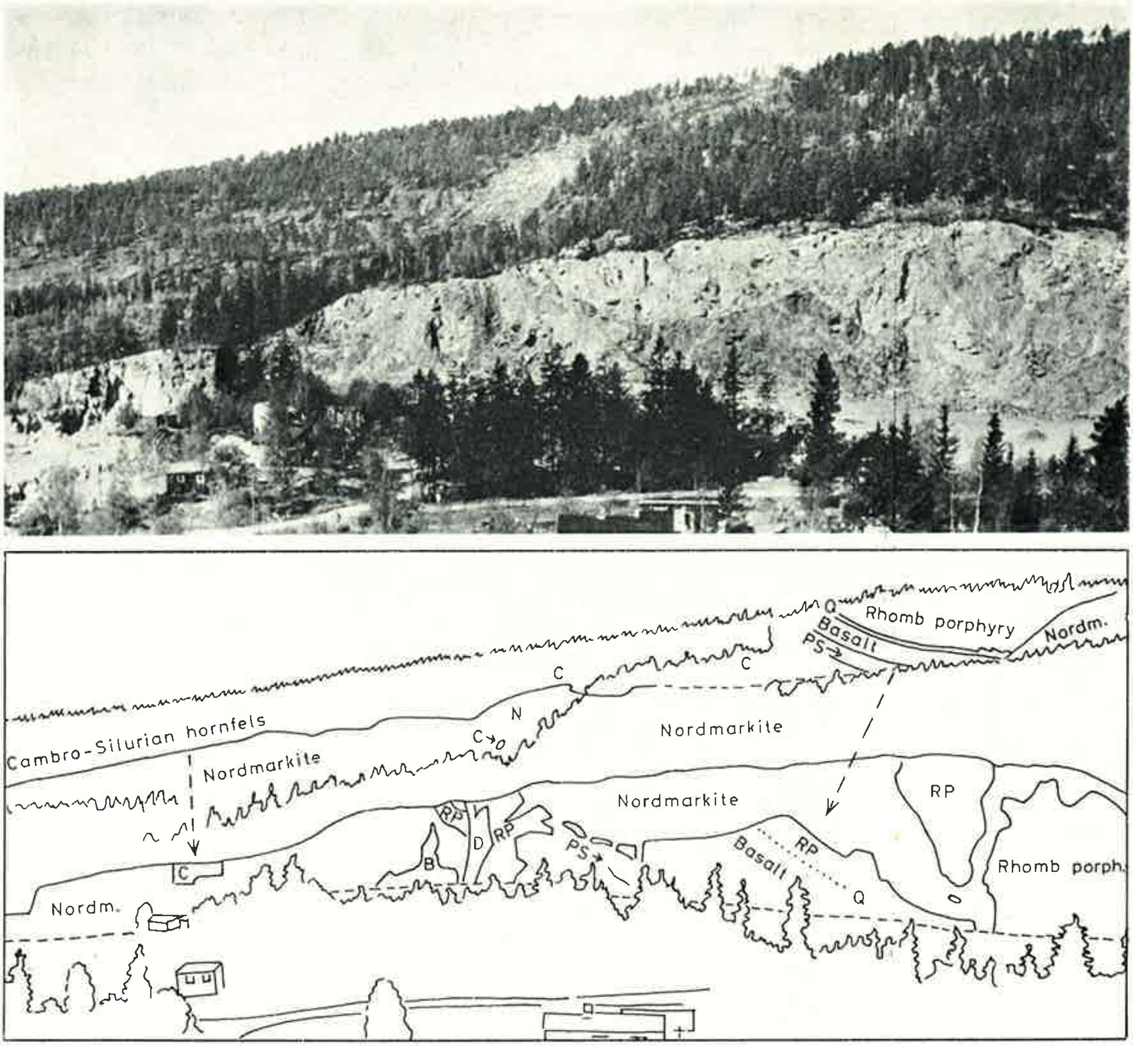

Fig. 2. Abandoned quarries north of Stig in the east slope of Grefsenåsen. The roof of the nordmarkite in the upper part of Grefsenåsen contains Cambro-Silurian hornfelses (C), Permian sediments (PS), basalt (B), quartzite (Q) and rhomb porphyry lava (RP). The nordmarkite walls contain partly rotated xenoliths derived from the roof. Diabase (D) (K/Ar age 219 m.y. (Dons 1977)) cuts xenoliths (Holtedahl 1965).

cauldron. Numerous xenoliths derived from the roof are seen in the syenite walls of the quarry. A detailed survey of the different xenoliths shows that most of them (but not all) have maintained their relative position during the subsidence (see Fig. 2). (Holtedahl in Holtedahl & Dons 1966).

On the way to stop 8 the excursion crosses the Cambro-Silurian sediments and enters the Bærum cauldron NW of Oslo. Stop 8 is at the very border of the cauldron, while stop 9 is inside.

8. The small road leading from road 168 to the farm Knabberud crosses the syenitic ring dyke which encircles the Bærum cauldron. To the north is

rhomb porphyry lava No. 11 which is part of the subsided block. To the south at approximately the same level are exposed the Permian sediments underlying the lavas. The cauldron subsidence is estimated to be about 800 m. In a small hill NW of Knabberud the lavas, basalt B_I and rhomb porphyry RP_I are gradually bent more and more into a steeper dip when approaching the ring dyke (Dons & Gyøry 1967).

9. Near Burud farm are found some rocks from high up in the lava stratigraphy which have been preserved inside the cauldron. Among these is one unit of ignimbrite, probably emplaced at a time when the activity of the central basalt volcanoes (corresponding to B_3) was interrupted by the caldera formation. Different types of porphyritic basalts and sediments will also be shown before the return to Sundvollen (Huseby 1970, Naterstad & Rui, in Dons 1977).