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Tittel

Geologiske undersøkelser i to områder i INDRE FINNMARK / KAUTOKEINO HERRED

Forfatter	Dato År	Bedrift (oppdragsgiver og/eller oppdragstaker)
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Fagområde	Dokument type	Forekomster (forekomst, gruvefelt, undersøkelsesfelt)
Geologi		Stuorajavrre, Sodnajavrre
Råstofgruppe	**Råstofftype**	
Malm/metall	Cu, Zn, Ni,	

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Rapporten er en kopi av NGU rapport nr. 510 B. Området som er beskrevet i rapporten dekker kartblad 18331 - 18334. Rapporten er et vedlegg.

Oppdrag:
STATENS MALMUNDERSØKELSER

NGU Rapport nr. 510 B.

Geologiske undersøkelser i to områder i INDRE FINNMARK / KAUTOKEINO HERRED

Utførende: John C. Barnett, geolog

Norges geologiske undersøkelse
Geofysisk avdeling
Trondheim

INNHOLD:

BILAG:

FORORD

Sommersesong 1963 utførte John C.Barnett, B.Sc.(geol.), en geologisk kartlegging i 2 områder i Indre Finnmark.

Det ene området -- angitt med stikkord "Stuorajavrre" -- ligger øst for Stuorajavrre og hører til Caskias-grønnsteinsgruppen. Hensikten til arbeidet her var å følge opp tidligere kjente kobbermineraliseringer, forsøke å finne sammenheng mellom disse innbyrdes og finne eventuelle relasjoner med geologien. De tidligere meldte mineraliseringer var forøvrig:

a. Coujajavrre
   1. Mineralisering av kobber- og svovelkis (Holmsen et al. 1967, NGU publ. 201, ss. 72-73)
   2. Geokjemiske anomalier rundt området (SRs prospektering i 1959 -- ingen rapport)

b. Soarvusjavrre — Svovelkismineralisering som nevnt i "Bolidenrapporten"

c. Hoallomaras — Kobberkismineralisering i albittfels og grafittskifer (GM-rapport 254 A. 1959)

d. Området Ø og NØ for Stuorajr. — Geokjemiske anomalier i bekkesedimenter (SRs prospektering i 1959 -- ingen rapport)

Det hersket dessuten i enkelte hold en viss mistanke om at det svakt kobbermineraliserte agglomeratdraget av Agjetjokka (Ref. GM-rapport 314 B, 1961) hadde sine fortsettelser her.

Undersøkelsen var et ledd i et forslag innsendt av undertegnede den 25. mai 1963 "Program feltarbeid i Indre Finnmark 1963", del A, "Oppfølging av ertsfunn", punkt 4 og 6. Forslaget er gjengitt i rapport 510 A, bilag II.

Det andre området -- angitt med stikkord "Sodnajavrre" -- ligger mellom riksveien Alta-Kautokeino og

Sodnajavrre, og hører i følge det geologiske kart av Vest-Finnmark (NGU-publ. 201) til en sone karakterisert av kvartsglimmerskifer med metamorfoserte basiske bergarter. Foranledningen til undersøkelsen her var antydninger til mineralisering, som kom frem ved blokkleting og geokjemisk prospektering i 1962. Ingen rapport er hittil skrevet av disse undersøkelsene men materialet er tilgjengelig i arkivene. Disse indikasjonene var forøvrig:

a. Funn av magnetkis i mange blokker og blotninger i området, ofte i forbindelse med grafittskifer.

b. Et funn av angivelig rik kobbermineralisering i grønnstein.

c. Geokjemiske anomalier (Cu, Ni Zn) i elvesedimenter i Masijokka ved Burgunvarre og Saivva.

Undersøkelsen ble anført som punkt 5 i ovennevnte forslag av mai 1963 i del A "Oppfølging av ertsfunn".

Som det fremgår av nevnte forslag, var forventningene om undersøkelsenes utfall langt fra store. Mange av disse indikasjonene er tidligere undersøkt og avskrevet. Det henvises til statsgeolog Per Holmsens rekognoseringsarbeid for Kautokeino Kobberfelter i 1956 (ref. brev fra NGU, datert Oslo, 17. januar 1957, til Kautokeino Kobberfelter) og rekognosering og blokkleting utført av de nåværende bergingeniørene Paul Paulsen og Inge Nåvik i 1958 (ref. deres rapport og dagbok i Kautokeino Kobberfelters arkiv). Gjennomføringen av undersøkelsen i disse to områdene syntes imidlertid nokså ønskelig, fordi det hadde nylig oppstått endel diskusjon og spekulasjon om betydningen av disse indikasjonene. Kartleggingens resultat ville forhåpentlig bringe tingene tilbake til de riktige proporsjoner.

Det synes mest hensiktsmessig å fremlegge Barnetts rapport i dens opprinnelige språk.

Bilag I er et kopi av noen kjemiske analyser på en prøve fra Masijokka bro, beskrevet av Barnett som "conglomerate with pyrrhotite matrix", og som senere ble registrert som prøve nr. 510-M-11 i vår steinsamling.

Bilag II er en liste av bergartsprøver som Barnett samlet fra Sodnajavrre-traktene, for tiden arkivert i vår steinsamling. Det foreligger ingen registrerte prøver fra arbeidet i Stuorajavrre-traktene.

Trondheim, 17. oktober 1968.

T.H. Tan

STUORAJAVRRE.

INTRODUCTION.

The area covered by this report lies largely on the Kautokeino and Raisjavrre mapsheets, with small portions of it on the Mollis an Carajavrre sheets (Mapsheets (AMS) 1833 II, 1833 III, 1833 IV and 1833 I respectively).

This area is bounded on the West by Stuorajavrre, Devkisaedno, Soarvosjokka and Cuolbmajokka, on the North by Cuolbmanjunnasat, on the East by Soarvosjavrre, Jorggajavrre, Soagesjavrre, Vouskoroggejokka and Coavjebottejavrre, and on the South by Gæssejavrre, Jaggejavrre and Avjasluobbal.

Previous reconnaissance mapping had been carried out in the area by the NGU during the summers of 1954 and 1955 (described in NGU publication No. 201, The Pre-Cambrian Geology of Vest-Finnmark). Block search, geochemical and geophysical work have also been carried out in the area. The details of the results of block-search are described in GM Rapport No. 254 A.

The object of this year's investigation was to map the area as thoroughly as possible, and to describe in detail the extent and type of the mineralisation (which was known to be present from the previous work).

TOPOGRAPHY.

This region consists of a series of North-South ridges, with lakes, rivers and marsh between them. The Northern and Western parts of the area drain Westwards into Stuorajavrre, and the Southern and Eastern parts drain Southwards into Cabardasjokka.

Exposure, except for the area around Cuojaluokta, is very poor. As the area is thickly wooded in many

places, any exposures that are present are often very difficult to find.

ROCK TYPES.

The whole of the area examined consists basically of a series of greenstones, bounded by quartzite on the East.

The Western part of the area appears to be made up entirely of amphibolites and lavas.

Between this Western part and the quartzites are exposures of stratified greenstones, and a little amphibolite and graphite schist. Albite-carbonate metasomatism has occurred in this middle zone to a considerable extent. Two occurrences of albite-carbonate rock were also found in the Western amphibolite zone.

The graphite schist, amphibolite and stratified greenstones are of typical West-Finnmark type, and merit no further description.

The only two rock-types which need describing are the vesicular lava from the Western amphibolite zone, and the albite-carbonate rocks.

Vesicular lava.

This is exposed along the peninsula West of Cuojaluokta, the promontory East of Rapesluokta, and the East side of Jouvllajokka.

It is a fine to medium-granied green rock. The vesicles are found in scattered concentrations, and contain quartz, epidote and occasionally magnetite. In places the concentrations of vesicles can be seen to coincide with the tops of individual lava-flows. This can be especially well seen on the shore of Stuorajavrre at the base of the peninsula West of Cuojaluokta. At this place large concentrations

of vesicles are seen immediately beneath an erosion surface marking the top of a lava flow about 1½ meters thick. Some of these vesicles are elongated at right-angles to the erosion surface - obviously due to movement of air bubbles, while the lava was in a very viscous state, so that the holes were preserved by almost immediate consolidation of the lava around them. In the North this vesicular series seems to be represented by ordinary amphibolites - so it is possible that a sill North of Juovllajokka emerged to form lava to the South. Otherwise the Northern amphibolite may merely represent non-vesicular lava.

Albite Carbonate rocks.

These are irregularly distributed metasomatic rocks (mainly in the central greenstone zone).

In the central zone various intermediate stages between stratified greenstone and albite-carbonate rocks are seen - notably South of Avjasjavrre - here are found greenstones, on the West of Avjasjokka, which rapidly become impregnated with calcite rhombs and layers, giving way to albite-carbonate rocks on the East.

Intermediate stages are also on Cuolbmanjunnasat.

There are two occurrences of albite-carbonate in the Western amphibolite zone, both very restricted in extent - one on the East side of the peninsula West of Cuojaluokta, and the other on the East side of the promontory East of Rapesluokta. Both of these are near to a fault which runs North-South along Cuojaluokta and is displaced to the West, North of Stuorasuolo, and possibly the metasomatism here could have been associated with this fault.

STRUCTURE.

Folding and Thrusting.

No evidence of either folding or thrusting, major or minor, was noted in the area.

Faulting.

There are many topographic features, in the area, visible from air photographs, which are almost certainly caused by faults. Owing to the poor exposure, however, it is rarely possible to confirm their presence in the field.

Two faults were, however, identified with certainty:-

The first of these faults runs North-South along Cuojaluokta, and is reflected by a very marked topographical feature (Cuojaluokta itself is 30-40 meters deep in the centre). It is not possible to ascertain the direction or amount of movement of this fault, which, to the North of Stuorasuolo, is displaced to the West by another fault.

This second fault, which is left-handed, has a movement of about 3/4 kilometre. It runs approximately East-West.

A possible third fault - along the line of Soarvosjokka between the points where it is joined by Cuolbmajokka and Njoaskejokka - is indicated by displacement of the boundary between the Western amphibolite zone and the central greenstone zone, and by topographical manifestations. This fault would be right-handed, and have a movement of just over a kilometre.

METASOMATISM.

The albite-carbonate rocks in the area have obvicusly been formed by metasomatism.

In many cases intermediate stages between stratified greenstone and albite-carbonate rocks are seen (see under "Rock Types").

Also on the point of the peninsula West of Cuojaluokta and again East of Rapesluokta, complete gradation from ordinary amphibolite to albite-carbonate can be seen.

These two occurrences are probably associated with the fault immediately to the East. It is also probable that other occurrences are associated with faulting, but this cannot be confirmed in the field owing to poor exposure.

In the albite-carbonates produced from stratified greenstone, relict stratification is invariably present.

CORRELATION WITH MAGNETIC AND ELECTROMAGNETIC DATA.

There are no electromagnetic anomalies of any significant magnitude in the area.

Owing to poor exposure any detailed correlation between geology and magnetic anomalies is not possible.

It is possible to see, however, a general correspondence between amphibolite layers and magnetic anomalies - the vesicular lava, for example, corresponds with a marked magnetic high anomaly zone, probably at least partly due to magnetite within it.

CORRELATION WITH GEOCHEMISTRY.

Information on copper anomalies in stream sediments is available over the area.

High anomalies were found on the peninsula West of Cuojaluokta, on the promontory East of Rapesluokta and in the lower part of Ravddojokka, around Jouvllajavrre and West of Jouvllajokka. These correspond with small amounts of copper mineralisation in fracture fillings in the vesicular greenstone.

High anomalies are also present to the South West of Goavjebottejavrre, corresponding with a little copper mineralisation in fracture-fillings of greenstone (blocks) and in calcite veins in albite fels (exposures).

A few anomalies were also found on Cappisvarre. No significant copper occurrence was found to explain this - although copper-mineralised blocks are present, which may be the explanation.

ECONOMIC GEOLOGY.

Mineralogy and Paragenesis.

The ore minerals present in the area (chalchopyrite, pyrite and magnetite) seem to have three different modes of occurrence and paragenesis.

The first type is confined to joint fillings along the Cuojaluokta fault zone, the mineralising solutions having presumably come up the fault. It consists of chalchopyrite, pyrite and magnetite (in one case haematite was also noted).

The second type is found in calcite veins in the albite-carbonate rocks, the mineralisation probably having been associated with the metasomatism. This type also comprises chalchopyrite, pyrite and magnetite.

The third type consists of impregnation in the greenstones, and includes pyrite, magnetite and haematite.

Chalchopyrite.

On the peninsula West of Cuojaluokta, and the promontory East of Rapesluokta and some way to the North of both (i.e. within the outcrop of the vesicular greenstone), are found a few small crystals of chalchopyrite in quartz-calcite veins. In one case the copper was in association with a little haematite, but this was probably fortuitous. Many blocks of this vein-type were found in the numerous blockfields along Jouvllajokka.

Chalcopyrite also occurs as rare crystals in the albite-carbonate rocks - in quartz-carbonate veins East of the South end of Cuojaluokta and on Cuolbmanjunnasat E of the 582 metres high peak.

Just outside the area mapped, 1½ kilometres East of Jorggajavrre, is a lake called Vaikanjavrre, which is Lappish for "copper-smelling lake", so that copper mineralisation is possibly present nearby.

Pyrite.

On the West side of Cuojavarre, Pehkonen (in 1954-5) found pyrite impregnation in a 150 x 20 metres zone, at the boundary between stratified greenstone and "diabase".

Another small zone was found this year on the East side. It was only 3 x ½ metre in extent, consisting of very small crystals impregnated throughout an amphibolite.

Small crystals of pyrite are occasionally found in the quartz-epidote and quartz-calcite veins in the vesicular greenstones, and in quartz veins in the albite-carbonate rock on the peninsula West of Cuojaluokta. Small specks of pyrite are also found in the quartz-calcite veins in the albite-carbonate rocks South of Cuojavarre, and in those East of the 582 metre height on Cuolbmanjunnasat, and also in the albite-carbonate rock itself South of Roggegieratjevrre.

Magnetite.

This occurs as widespread crystals and crystal-masses in the quartz-epidote veins in the vesicular lava, as a restricted impregnation on the West of Cuojavarre, and as small crystals in the albite-carbonate East of the 582-metre height on Cuolbmanjunnasat. It is also present in some of the vesicular lava.

Haematite.

This was noted in one vein on the peninsula West of Cuojavarre, and as staining in amphibolite on the 493-metre height on Cuolbmanjunnasat.

Deposit.

The largest visible extent of mineralisation is that found in the quartz-epidote veins in the vesicular greenstones.

These veins are very narrow (3 - 5 cm wide) and very numerous in the Southern part of the outcrop - on the Western side of Cuojaluokta they occur every 1/3 - 1/2 metre. They are obviously joint-fillings.

Apart from magnetite, which is widespread in these veins, small quantities of pyrite, chalchopyrite, haematite, actinolite and scapolite are present. Calcite is present in some of them on the N.W.-aligned shore East of Stuorasuolo.

They are concentrated along the East side of the peninsula West of Cuojaluokta, and are very infrequent on the other side of the peninsula. This strongly suggests that the mineralisation was connected with the Cuojaluokta fault.

The veining is also less frequent on the N.W.-aligned shoreline South and East of Stuorasuolo, - a few quartz-calcite veins occur at the Southern end, and these contain pyrite, chalchopyrite and scapolite in small quantities - also much epidote. Further North very thin (1 - 3 cm) quartz-epidote veins are found every 1-2 metres, occasionally containing pyrite. After the shoreline swings to the North North East, exposures die out.

On the promontory East of Rapesluokta veining is very infrequent - occasional very thin (1 - 3 centimetres) quartz-epidote veins occur, with, rarely, a few chalchopyrite crystals.

Mineralisation is very restricted in the other two modes of mineralisation in the area (i.e. scattered specks of chalchopyrite, pyrite and magnetite in quartz-calcite veins in the albite-carbonate rocks, and various isolated impregnations (magnetite, pyrite and haematite).

Block Search.

The results of block-search in the area are covered by GM report No. 254/A.

There do not seem to be any significant concentrations of mineralised blocks which are not explicable on the basis of those mineralised exposures already found in the area.

CONCLUSIONS AND RECOMMENDATIONS.

The area contains small amounts of mineralisation, of different types, throughout. None of these occurrences, however, could ever conceivably be of any economic interest.

As the area is so poorly exposed, further geological examination is impossible, neither have geophysical methods yielded any promising anomalies.

It is therefore recommended that further research should not be undertaken in the area, as further examination is unwarranted.

Trondheim, November 14th 1963.

J.C. Barnett (sign.)

SODNAJAVRRE.

INTRODUCTION.

The area covered by this report lies on the Carajavrre map-sheet (AMS 1833 I), and is bounded on the South by Masijokka, on the West by Sodnajavrre, and on the North and East by the limits of the map-sheet.

General geological mapping was carried out with more detailed attention being given to the graphite schist, which was known, from previous work, to be impregnated with pyrite and pyrrhotite in some places.

Previous reconnaissance mapping had been carried out, by the NGU, in this area during the summers of 1954 and 1955. This is described in NGU publication No. 201 (The Pre-Cambrian Geology of Vest-Finnmark). Block-search, geochemical and geophysical research had also previously been carried out in the area.

TOPOGRAPHY.

The North of the area consists of higher ground (600-650 metres), with more or less gently rounded hills. South of this higher ground are many North-South aligned ridges, with rivers, streams and marsh between them, draining Southwards into the Masijokka.

The area is much covered by drift, and exposure is poor.

ROCK TYPES.

The following rock-types are found in the area: quartzite, mica-schist, graphite schist, albite-carbonate fels, hornblende schist, amphibolites and argillite.

The succession, except in the extreme West, appears to be as follows:

Hornblende schist
Albite carbonate fels
Graphite schist
Mica schist
Quartzite

In the extreme West are found the argillite, and the brecciated greenstone which marks the Western boundary og the area.

The hornblende schist is found on the high ground in the North, with a large area of mica-schist to the South of it, with the fels and graphite schist outcropping along the boundary between the two.

The quartzite outcrops around Burgunvarre and Gukkesjavrre. The amphibolites occur on Jejgos, on Buvrascokka and on a small ridge about 1 kilometre to the North of it, and from the North end of Diravarre an amphibolite outcrops South-Eastwards towards Masijokka. There is also a narrow amphibolite sill just within the Western boundary of the quartzite.

There is probably some kind of tectonic break between the argillite and the rocks to the East of it.

QUARTZITE.

This seems to be an isolated anticlinal occurrence of the Masi quartzite, about ten kilometres from the main band of outcrop to the East. Its color is variable, and it may be pink, white or yellow. It is massive and irregularly fractured. In one place South-East of Masivarre, a few crystals and impregnated patches of fuchsite were found.

On the Western side of the outcrop, South-East of Masivarre, the boundary between the quartzite and the overlying mica-schist is exposed, and is seen to be quite conformable. The boundary is not abrupt - the quartzite becomes interlayered with mica-schist bands of various thicknesses, before the

mica-schist proper succeeds the quartzite. These interlayered schists are impregnated with occasional small crystals of pyrite. Near the boundary the quartzite contains an appreciable amount of feldspar, and also calcite, crystals and veins of secondary origin.

MICA-SCHIST.

This is a very variable formation, and contains quartzitic, graphitic, calcareous and chloritic layers. None of these variations were found to be sufficiently persistent, or exposed, to make mapping of them possible.

It is generally dark-coloured (biotitic) very fissile, and more or less quartzitic. It is often iron-stained to some degree.

GRAPHITE SCHIST.

This occurs at the boundary between the mica-schist and the hornblende schist.

The graphite content varies considerably, as does the thickness (1-4 metres) - in some cases the richest graphitic portions have obviously been squeezed out tectonically.

With different graphitic content, the colour varies from dark grey to black, and the texture from fissile to almost massive.

In two places where it outcrops South-East of Jejgos, it contains thin layers of pyrite (see under mineralogy). It is always ironstained to some extent. In several cases in the Maiddonjavrre - Jejgos region, there are thick layers of iron-pan found in places where the graphite-schist would be expected to occur if it was exposed. This iron-pan is therefore presumably derived from the iron-content of the graphite-schist beneath it.

The graphite-schist is almost invariably associated with a fels layer which occurs immediately above it:-

ALBITE CARBONATE FELS.

This is a light-coloured (pale grey-yellow) massive rock, and appears to be usually about two metres thick.

Thin sections were made from this fels in two cases - one from North of Maiddonjavrre, and one from South of it. Although in the first case the fels is yellow, and in the second, almost grey, under the microscope they appear almost identical - presumably the colour difference is due to differing iron content, -the former is mottled with darker brown patches, the latter hardly at all.

Microscopically, large anhedral twinned albite crystals are seen to be enclosed in a ground mass of quartz, feldspar and calcite. The calcite makes up 10-20% of the groundmass, anhedral calcite crystals being enclosed by the other minerals. It is not possible to estimate the relative proportions of quartz and feldspar in the ground-mass.

In the specimen from North of Maiddonjavrre there are lensoid bodies of large anhedral quartz crystals.

The rock as a whole cannot be metasomatic as is the case with many of the albite-carbonate rocks found in Finnmark, and must be primary in origin.

HORNBLENDE SCHISTS.

These are finely-divided, fine-grained light-coloured rocks, probably representing metamorphosed tuffs.

The series is generally very homogeneous, except for the occurrence of a quartzite, within the schist, which is found in a stream South-East of Ittenvarre. This quartzite is at least 10 metres thick, but is not exposed elsewhere in the area. It is dark-yellow to brown, in colour, due to iron staining. It's lower boundary with the hornblende schist is exposed, and seen to be quite conformable. Immediately below it is a narrow micaceous band 1-2 metres thick, and below this is hornblende schist again. The upper boundary is not exposed.

[illegible]

This is a soft, very fissile, finely-divided light - to medium - grey rock. It's texture is homogeneous throughout.

[illegible]

These are dark-green intrusives, with variable grain-size - usually medium-grained.

Except for the amphibolite on Jejgos whose relationship with the surrounding rocks is uncertain, they are sill-like bodies. The Jejgos amphibolite seems to be more massive and coarse-grained, but may be sill-like nevertheless.

Amphibolite from the small sill, 2-3 metres thick, within the main quartzite outcrop near it's Western boundary with the mica-schist, was examined in thin section. It differs from the other amphibolites in the area in that it is much darker in colour, and contains a larger proportion of amphibole and biotite.

Hornblende, in pale-green pleochroic anhedral crystals, makes up above 80% of this rock, while quartz and feldspar (albite) account for approximately 10% and biotite for 9%. Pyrite (1%) and altered pyroxene also occur. The quartz is anhedral, cloudy, and contains bubbles. The feldspar is occasionally twinned. The biotite crystals,which are anhedral, are arranged in sub-parallel rows, associated with small subhedral pyrite crystals.

BRECCIATED GREENSTONE.

This, which marks the Western boundary of the area, is also the extreme Eastern limit of the greenstone series to the West. It is exposed in Masijokka, W. of Masivarre. White calcite fills irregular fractures in the rock,

so that subsequent differential weathering gives it an almost agglomeratic appearance. Numerous small shear planes are visible microscopically.

The fractured zone is 10-20 metres wide, and is also found on a small hill North of Bollus, 10 kilometres to the North.

STRUCTURE.

I. Folding.

Suonjeroaivve - Buvrasvarre syncline. This is shallow with it's Western limb dipping 10-20°, and its Eastern limb 0-15°. The axis of the synclines is between Suonjeroaivve and Buvrasvarre, striking at about 20°.

Burgunvarre - Gukkesjavrre anticline. The quartz outcrop in this area represents the axial par an anticline.

The dips steepen away from the core on the West, being shallow along Masijokka East of Masijavrre, with dips around 25°, and steep on Masivarre itself and to the West of it (around 80°). This is the Western limb of the anticline. Only a few dipmeasurements were obtainable on the Eastern limb, and all were fairly shallow. Thus the anticline is apparently asymmetrical. The axis strikes slightly East of North.

The shape of the outcrop of the mica-schist - South-East of Jejgos reveals a small anticline. This is isoclinal, dipping to the East. The dips vary between 20° and 50°.

The broad band of mica-schist, which strikes North-East-wards, just to the West of Suonjeroaivve, must also be anticlinal, and the long tongue of Hornblende schist to the West of this synclinal.

MINOR FOLDING.

This occurs frequently in the North-West part of the area, and was also noted at one place in the mica-schist North-East of Masivarre.

In every case the axes of these minor folds have the same strike as the surrounding rocks, i.e. parallel to the major folds.

All the minor folds that were noted, in the North-West part of the area, were very near to the graphite schist suggesting that they were caused by movement which took place along the plane of the graphite layer, at any rate in some cases.

II Faulting.

Apart from the fault which brecciated the greenstone at the Western boundary of the area, and a postulated break between the mica-schist and the argillite, only one other fault was noted in the region. This is South of Masivarre, and is a right-handed fault, with movement of the order of 200-300 metres. It strikes E-W.

The fault which brecciated the greenstone West of Masivarre, is striking, at this point, very slightly West of North. It seems to swing slightly to the West as it progresses Northwards striking North-West on the small hill North of Bollus.

The fault zone, 10-20 metres wide, is steeply dipping (80°). It is a strike fault, so that the direction and amount of movement cannot be ascertained.

The so-called "brak" between the mica-schist and the argillite, which represent different metamorphic zones, has been previously reported by both Holtedahl and Holmsen.

The contact between these two rock-types is exposed in Masijokka, to the South of Masivarre, but positive evidence for a fault is not visible - obviously extensive

fracturing and mylonitisation could not be expected in argillite and mica-schist.

The presence of a fault between the two rock-types seems, however, to be the only reasonable explanation for the juxtaposition of these two different metamorphic grades. The movement of this postulated fault would be considerable. It would presumably be left-handed, bringing the more metamorphosed schists up from the South on the East side of the fault.

III Thrusting.

The only evidence of thrusting in the area is found North of Havggajavrre.A small thrust plane is found within the mica-schist at this place.

The plane of movement is on a thin layer of graphite schist, which has probably been attenuated by the thrusting - it is now only a few centimetres wide. Over the thrust plane the rock shows steep overfolds and fractures whereas the rock beneath is completely unfolded.

It is probable that thrusting on the plane of the graphite schist has occurred elsewhere in the area - this is suggested, for example, by the fact of the minor folds, in the North-West of the area, only being found near the graphite schist. Any large-scale thrusting, however, is unlikely.

METAMORPHISM.

Apart from the extreme Western part of the area, the whole of the mapped area appears to belong to the biotite zone - secondary biotite occurs throughout the mica schists.

The argillite in the West, however, is obviously of a lower metamorphic grade, and is assigned to the chlorite zone.

The abrupt break between these two zones seems to be tectonic, and is described under "Faulting".

CORRELATION WITH MAGNETIC DATA.

In two cases high magnetic anomalies can be correlated with the presence of amphibolites - one South-East of Havggajavrre, and the other on Jejgos.

Two other high anomalies, on Suonjeroaivve and South-West of Buvrasvarre respectively, may also be due to the presence of amphibolite, as other small amphibolite bodies are found in this part of the area. If amphibolites are the cause of these two anomalies, they are not exposed, however.

A high anomaly South-East of Ittenjavrre is inexplicable at present, as deep drift covers the anomalous area.

Two high anomalies are found over the quartzite outcrop. The calcite-quartz-pyrite veins in this area cannot explain these anomalies, so more extensive mineralisation may be present but not exposed. This view is supported, to some extent, by the presence of high geochemical anomalies corresponding exactly with the quartzite outcrop. The quartzite represents the axial part of an anticline, so that extensive fracturing, which may later have been mineralised, could be expected.

The mineralised conglomerate, found in the Masijokka in the extreme Eastern part of the area, and on Vouvdasoaivve, eight kilometres to the North, gives no magnetic anomaly. This is surprising since it has a ground-mass consisting almost exclusively of pyrrhotite.

There is, however, a small anomaly about 250 metres to the West of the mineralised conglomerate in Masijokka, and this may represent associated mineralisation - or possibly a small amphibolite occurrence.

CORRELATION WITH GEOCHEMISTRY.

Information on anomalous values for Zinc, Nickel, Copper and Heavy Metals, is available over the area.

"Heavy Metals" includes Zinc, Cobalt, Copper, Lead and Nickel, but laboratory recovery of these is not equal, and is respectively, 100%, 60%, 40%, 20% and 2%.

In the case of Zinc, Nickel and Heavy Metals, high anomalies are found coinciding nearly exactly with the outcrop of the Quartzite - in the case of Heavy Metals anomalies are also found downstream from the outcrop. The minerals causing these anomalies may be connected with the quartz-calcite-pyrite veins along the Western boundary of the quartzite, but this is unlikely, owing to their limited extent. Other mineralisation in the quartzite would be a more satisfactory explanation for these anomalies (see "Correlation with Magnetic Data").

Other high anomalies are found intermittently South of the Graphite Schist layer - Zinc anomalies near Havggajavrre and Ittenjavrre; Nickel, West of Maiddonjavrre and in a zone stretching North-Eastwards from the Quartzite to Havggajavrre; Heavy Metals, near Havggajavrre, Ittenjavrre, Maiddonjavrre and Roggajavrre; and Copper, to the North-West of Maiddonjavrre.

High anomalies are also found around Vouvdasoaivve - Nickel, Copper, Zinc and Heavy Metals on the West, and Zinc and Heavy Metals on the East.

The anomalies South of the Graphite schist obviously originate from the mineralisation (Pyrite, pyrrhotite) in the graphite schist.

The Vouvdasoaivve anomalies must originate from the chalchopyrite - pyrite - pyrrhotite mineralisation which occurs in brecciated zones there.

No significant anomalies are found near the mineralised conglomerate in Masijokka near to (one kilometre away) the road-bridge.

ECONOMIC GEOLOGY.

A.

Pyrite occurs, with a little pyrrhotite, within the graphite schists South-East of Jejgos, particularly on the East side of the small hill which runs South from East of Jejgos.

B.

Pyrite and a little magnetite is found along the Western boundary of the quartzite area.

C.

Pyrite, pyrrhotite and a little chalcopyrite occur in outcrops by the side of Masijokka, about one kilometre North-West of the road bridge.

Pyrite is also found between these outcrops and the road bridge - ans also beyond the road bridge.

(D.

Pyrite, pyrrhotite and chalcopyrite occur on Vouvdasoaivve, as described in 1962. This will be partly redescribed for purposes of comparison with occurrence C.)

I MINERALOGY AND PARAGENESIS.

Macroscopic examination.

A)

The pyrite of this occurence is in very thin bands (1/4 - 3 millimetres wide), between 1 and 3 millimetres apart from each other.

The graphite schist layer in which it is contained is at least two metres thick, but only about ½ metre thickness is mineralised.

As well as this layering of pyrite there are local thicker patches and aggregation of this mineral.

In several places, to the North and South of this occurrence, are found large deposits of iron-pan over the expected position of the buried graphite-schist. These are presumably derived from mineralisation in the schist.

B)

In this occurence the pyrite and magnetite are contained in the calcite veins, which are found in the quartzite near its Western boundary.

These calcite veins are 15-20 cms. broad at their widest, but vary in thickness over short distance. They are pink or white in colour, although often stained with iron, presumably from the pyrite. The pyrite is in the form of crystals and crystal aggregated up to 8 cms. in diameter. Magnetite is also present in very minor quantities. Muscovite (pale-green in colour), scapolite, epidote, hornblende and quartz are also found in these veins.

C)

The mineralisation in Masijokka, near the road-bridge, is contained within a quartz mica-schist series. Quartzitic layers of various thicknesses abound, and there is some albite-carbonate metasomatism and carbonate veining, mostly to the East of the most extensive mineralisation.

The minerals present are pyrrhotite and pyrite, with some calchopyrite. They occur mainly as matrix for conglomeratic layers, which sometimes appear somewhat brevviated, and also as veins filling fractures up to one metre across.

Eastwards to, and beyond, the road-bridge, are numerous calcite veins, and albite-carbonate rock. These calcite veins contain innumerable pyrite crystals and crystal aggregates up to 15 centimetres across.

The whole modes of mineralisation, and the rock-types, resemble very closely the mineralised occurrence around Vouvdasoaivve (which was examined in 1962) - although the latter is more extensively brecciated.

Polished section and thin section examination.

A)

The pyrite-containing graphite-schist from South-East of Jejgos was seen, in polished section, to consist of irregular layers of pyrite, often showing incipient crystal form, contained in the graphite schist matrix.

The original layers of the graphite schist can be seen to have been distorted by the crystallisation of the pyrite. The crystal masses also enclosed pieces of the graphite schist. The pyrite layers appear to be associated

with the more graphitic layers - possibly because crystal growth was easier in these layers.

The few pyrite crystals present show hexagonal form. This might be due to replacement of quartz, which can be seen to be present in small quantities in the hand section - otherwise it may represent a combination of pyritohedral and octahedral crystal forms.

Small quantities of magnetite, showing good crystal form, and always separate from the pyrite layers, also occur. This was presumably formed at a different time from the pyrite.

Both these minerals were probably formed from iron contained in the original schist, which,under suitable conditions, later crystallised out.

C)

The mineralised conglomerate from Masijokka is seen, under thin and polished section examination, to consist of small rounded pebbles (ranging in size almost exclusively between 1 millimetre and 1 centimetre in diameter) enclosed in a mineral matrix consisting largely of pyrrhotite, with some chalcopyrite.

The pebbles consist largely of quartz and recrystallised quartzite, with some feldspar and coloured minerals. A few angular fragments were present, suggesting a certain amount of brecciation (probably pre-mineralisation). Some of the pebbles appear to be shattered.

Obviously, the pyrrhotite (and chalcopyrite) has replaced the original matrix - the edges of many of the pebbles have been slightly eroded by the ore, and ore fills cracks and fissures in them.

Occasional aggregations of calcite are also present. These also seem to have replaced the original pebble material to some extent but apparently this occurred before the emplacement of the ore, as the ore is seen to have eroded and penetrated the calcite crystals, and is also found, in some measure, inside them.

Polished sections show the chalcopyrite to be confined to cracks in, and surfaces of, the pebbles. Pyrrhotite also fills cracks in pebbles, and also makes up the matrix (chachopyrite represents only a very small proportion of the ore). In some cases the contact surfaces between chalchopyrite and pyrrhotite are intimately intermingled, indicating simultaneous deposition.

The pyrrhotite is altered to limonite on the surface, and along cracks which penetrate from the surface.

The percentage of ore in the two samples from which thin sections were made is about 40%, but would obviously vary to some degree in different samples.

Owing to the macroscopic similarity of this Masijokka occurrence to that on Vouvdasoaivve, thin sections and polished sections of the latter were re-examined. This examination confirmed the original impression that the two occurrences are essentially similar, except that in the case of Vouvdasoaivve more extensive brecciation has taken place - nevertheless it is still possible to recognise rounded pebbles of quartz, quartzite and feldspar.

II DEPOSIT.

A)

The deposite of the layered pyrite mineralisation seems to bee at least 1 kilometre long, judging from the outcrops on the E. side og the small ridge South-East og Jejgos.

However, deposits of iron-pan indicate that it probably extends another ½ kilometre Northwards, and may also be present, to some extent, on the West side of the ridge.

B)

The pyrite crystal and crystal aggregate mineralisation in calcite veins at the Western edge of the quartzite is apparently confined to a narrow zone about one kilometre in length.

c)

The basic similarity of the Masijokka mineralised conglomerate to the more brecciated mineralisation on Vouvdasoaivve has already been remarked on.

It is possible, therefore, that these two occurrences are connected, in which case the mineralisation extends over at least eight kilometres - and further extension to the South seems probable, and possibly also to the North.

The average width of the Masijokka mineralisation is around 5-10 metres, and the Vouvdasoaivve occurrence was calculated to provide between 2480 and 5200 tons of ore per vertical metre, so if the two occurrences are in fact connected, a considerable tonnage of ore must be present.

III BLOCK SEARCH.

Many graphite schist blocks, occasionally containing pyrrhotite or pyrite are found North of the graphite schist outcrop or expected outcrop, particularly North-East of Buvrasvarre, suggesting that mineralisation is present to some extent throughout the graphite schist - direct confirmation of this is impossible, however, owing to lack of exposure

Rust zones along the expected position of buried graphite schist have already been mentioned (see Rock Types, and Mineralogy). A few graphite schist blocks have been found to the South of the outcrop - either these must have been waterborne from the North (they all, in fact, were found in stream and river courses), or ice-transported from some layer to the South of the area.

A few fels blocks are found to the North of the fels layer associated with the graphite schist. Fels blocks to the South of this layer obviously originate from feldspar - rich layers at the boundary of the quartzite.

Quartz blocks, with pyrite. and sometimes chalchopyrite, mineralisation are scattered over the area. Their origin is accounted for by the quartz-veins which are

found throughout the region, and also to some extent by the quartzite around Gukkesjavrre and Burgunvarre, and in Masijokka at the Eastern boundary of the area mapped.

CONCLUSIONS AND RECOMMENDATIONS.

The two occurences A and B obviously of no economic significance.

Occurrence C, the mineralised conglomerate and breccia in Masijokka, does, however, merit further examination in order to ascertain if it is in fact connected with the mineralisation on Vuovdasoaivve.

As the area between Vouvdasoaivve and Masijokka is deeply drift-covered, further geological examination would be pointless.

It is therefore recommended that magnetic and self-potential measurements be undertaken in detail over the area bounded by the grid-lines 9400 and 9600 East, and 0100 and 1300 North.

This should determine whether further research (e.g. diamond drilling) was warranted.

Furthermore, in order to obtain a more representative picture of the mineralisation, sampling and analysis (Nickel, Copper and Gold) of the occurrence should be undertaken (a few analyses are being made at present, but these are insufficient in number to enable a true evaluation of the mineralisation to be made).

Trondheim, 21. november 1963

J.C. Barnett (sign.)

Trondheim, 10. desember 1963.

A n a l y s e r a p p o r t

fra : Kjemisk avdeling
til : Geofysisk avdeling (J.C. Barnett/ T.H.Tan)

Oppdrag: Bestemmelse av Cu. Ni, Au og Fe i to prøver bergart, merket: "Masijokki öst" og "Masijokki vest".

Utført av: Spektrografisk lab. v/ T. Sivertsen.
Kjemisk lab. v/ J. Wik.

Resultat:

Pröve mrk.	Cu %	Fe %	Ni %	Au g/tonn
"Masijokki öst"	0.41	33.49	0.08	Ikke påvist < 0.2 g/tonn
"Masijokki vest"	0.43	36.16	0.10	Ikke påvist < 0.2 g/tonn

KJEMISK AVDELING

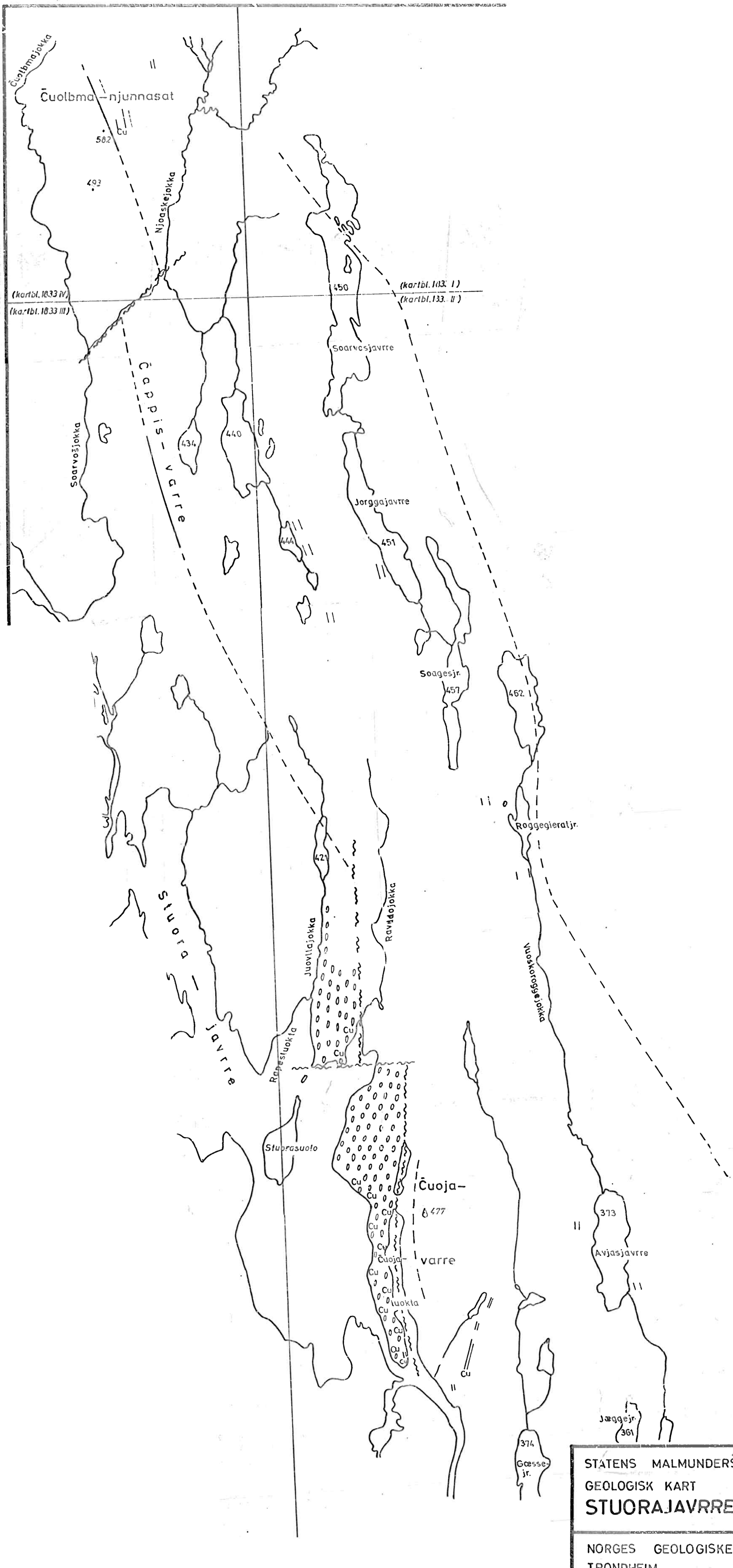
Aslak Kvalheim
direktör

J. H. Bersvendsen
J. H. Bersvendsen
sekr.

BILAG II
Rapport 510 B

Barnett's prøver fra Sodnajavrre-traktene.

510-M-01	Grafittskifer, fels osv. Koord. 850.096, Kartblad Carajavrre
510-M-02	Calcite-rich fels? Stream between Maidonjavrre and Ittenjavrre
510-M-03	Pyrite + Qtz vein in Quartzite E of Masijavrre
510-M-04	Block of pyrrhotite etc. S og W-end of Suonjeroaivve
510-M-05	Mica-schist with pyrite and chalcopyrite. Layer in quartzite, E of Masijavrre
510-M-06	Quartzite and Fuchsite E of Masijavrre
510-M-07	Cu in calc-vein N of Maidonjavrre
510-M-08	Agglomerate and tuff W of Masijavrre
510-M-09	Graphite schist fels NW of Maidonjavrre.
510-M-10	Graphite schist with pyrite mineralisation Occurrence "A".
510-M-11	Conglomerate with pyrrhotite matrix Occurrence "C".



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