evidence shows that the ores were introduced *after* the complete differentiation and solidification of the magma. Many facts point to the conclusion that the important concentration of the ore, took place *during* a regional metamorphism, probably connected closely with the eruption of the basic rock, and *later* by a stimulated aqueous activity, following the eruption.

(2). Considering the ore bearing rocks themselves, they are found to be essentially similar. They all belong to the gabbro family, and while showing minor points of difference, for practical purposes they can be considered as identical.

(3). The deposits while lying well within the limits of the basic eruptive, generally occur at or near its contact with other rocks, especially granites and mica schists.

The rocks show to a greater or less extent the effects of dynamic metamorphism, accompanied by breccia-tion and shearing. These are perhaps more apparent in the Subdury field than the others studied, but are never failing.

(4). The mineralogical relations are practically the same in all the deposits. Pyrrhotite containing nickel is predominant. Associated with it are varying amounts of chalcopyrite, pyrite, and magnetite, (usually very subordinate), and the rarer minerals (at times), pentlandite, sperrylite, etc.

(5). The ore frequently occurs as a cement for the brecciated rock fragments and along shear planes. This often gives to the ores a vein-like appearance or zonal structure, as is well seen in both the Sudbury and Sohland deposits.

(6). The rocks associated with the ore are strongly altered, and characterized by the presence of much secondary, green and amphobilitic hornblende, chlorite etc The effects of metamorphism and the development of secondary hornblende are most marked near the ore-bodies, and diminish away from them. And in general the more complete the alteration of the rock, the more complete has been its replacement by sulphides.

(7). Microscopically the relations of the ore and rock emphasize the fact that the sulphides are a secondary introduction. The relations of the magnetite and ilmenite, which are for the most part primary, are in striking contrast to the sulphides. While the latter are found in positions originally occupied by primary rock constituents, the former are in the form of grains and crystals in the midst of the sulphides, and dark silicates, apparently unaltered and with their original outlines. The sulphides on the other hand, replace both the fresh and altered rock constituents, often forming more or less complete pseudomorphs. The replacement takes place between the fibres of the secondary hornblende; along the cleavages of the fresher and more compact minerals, etching them and breaking them up into granular aggregates; between crystal fragments; and along planes or zones of shearing and parting.

The dark silicates, owing to their chemical composition, and susceptibility to metamorphic changes, are the first attacked. But as the effects of metamorphism become more pronounced, the more acidic minerals (feldspars) are partly or wholly altered, and replaced by ore.

Another interesting fact, noted especially in the Sudbury, Sohland, and Norwegian deposits, is that where the contact is along granitic or gneissoid rocks, the latter have been slightly mineralized. The change is usually accompanied by a migration of secondary hornblende into the acidic rock, and a replacement of its basic constituents by ore. The granite of the Sohland deposit is often sensibly altered and metamorphosed, both as a result of the eruption of the proterobase, and later by the ore-bearing solutions. The schistose and gneissoid contacts of many Norwegian deposits are often penetrated by ore for some distance, along cracks and planes of parting, which can only be explained as a deposition from solution.

Nickel in the Sohland Ore.

At the request of Prof. Beck, I made a number of experiments with Sohland pyrrhotite, in the endeavour to determine in what form the nickel was present. From the general similarity, both in geological relations and mineralogical composition, of the Sohland and Sudbury deposits, it was thought probable that the nickel might be in the form of a definite mineral, such as pentlandite. Both varieties of the pyrrhotite were examined, but no mineral resembling pentlandite was visible to the naked eye. Chalcopyrite in small nests and aggregates is intimately mixed through both the fine and coarse grained ore, and is very difficult to separate from the pyrrhotite.

After crushing, the ore was sized through Nos. 10, 20, 30, 40, and 80 mesh sieves. The various sizes were then magnetically separated by means of a small horse-shoe magnet. Practically none of the ore was *non-magnetic*, except the chalcopyrite, and rock minerals, and these were rejected as well as possible. Part of the pyrrhotite however, was not so susceptible to magnetic attraction as the rest, and this was carefully examined. It was freed from impurities as well as possible, and treated with dilute hydrochloric acid, to remove oxidation products. In appearance the grains were of a very light bronze-yellow color, but showed little trace of the characteristic parting of pentlandite. These were then picked over under a lens, and only the purest part selected. It was found however, very difficult to obtain a satisfactorily pure product, as small particles of chalcopyrite adhered very closely to some of the grains.

Both varieties of the ore were treated in this way, but from the massive fine grained variety, it was impossible to prepare even an approximately pure sample, so the residue from the coarse platy variety was taken. An analysis of the prepared material, showed that it contained 7,5% nickel, and 1,90% copper. As many samples of the purer pyrrhotite in their original state contain as much as 6 or even 7% nickel; and the particular piece examined, slightly over 7%, it is clear that no appreciable concentration has been effected.

In regard therefore to the condition of its nickel, the Sohland ore differs markedly from that of Sudbury. At the present moment it cannot be said that pentlandite *does not* exist in the Sohland ore. But if it does, it must be in a very fine state of division, and intimately and uniformly distributed through the pyrrhotite, so that it cannot be separated by magnetic means.

As another alternative we may fall back on the assumption that the nickel is an essential constituent of the pyrrhotite, isomorphously replacing the iron. A third possibility is that the nickel is present in a definite mineral, which is itself magnetic, and so does not allow a separation from pyrrhotite by means of a magnet.

The results of these investigations, I submit in the hope, that they may throw some additional light on this interesting and important class of ore-bodies, and perhaps help to clear up some of the disputed points in the science of Ore-Deposits.