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MEMORANDUM:

NOTES ON GEOCHEMICAL PROSPECTING.

From the 18th to the 28th November, 1948, Dr. V.P. Sokoloff of the United States Geological Survey visited the West Coast of Tasmania and demonstrated at various mineral fields prospecting by geochemical methods.

This method depends on the recognition in soils, rocks, surface water or vegetation of traces of metallic salts by means of their reaction with certain organic reagents. These reagents produce various coloured solutions with different metals at definite pH values.

The whole operation can be divided into three phases:-

1. The taking of samples;
2. Laboratory work; and
3. Interpretation of results.

1. Greatest care must be exercised in the collecting of samples to ensure that no contamination or "salting" has occurred in the area to be examined. Thus not only must all old workings be avoided but also any area that may be impregnated with ground water from any workings. An ideal condition is an old residual soil on a fairly flat terrain. A traverse is run across the area to be examined and samples taken at regular intervals - say every hundred feet. Vertical samples are taken at each point at set intervals either down to bedrock or to a definite depth. After laboratory tests have been made, other traverses are run and samples may be taken at closer intervals on the first traverse. In rock sampling, the samples may not be taken at definite intervals on the traverse but at every change of outcrop.

2. The laboratory work is more the concern of the chemist than the geologist. The samples are first dried and a definite weight - say 10 grams - is digested with sulphuric acid. It is then filtered and the correct pH value for the metal concerned is obtained by the addition of either more acid or of ammonia. A definite proportion of solution and reagent in carbon tetrachloride is shaken up together for a few minutes. Meanwhile a standard solution of the metal concerned has been shaken up with the reagent so that intensity of colour may be observed. The most common reagent used is Dithyzonediphenylthiocarbozone but for nickel tests Dimethylglyoxine is more efficient. By means of comparison with standard solutions, a scale of intensity of concentration of the metal concerned can be established and on the

result of the colour obtained the sample is listed as so many gamma. These tests are extremely sensitive and a few parts per million can be detected. For this reason it is vital to have all reagents,distilled water and apparatus absolutely free from any traces of metal. If more than one metal that reacts at much the same acidity is present - say zinc and lead - one may be complexed with certain salts so that it goes into the aqueous layer.

3. After graphs of the various traverses have been made, the interpretation of results commences. Dr. Sokoloff emphasised the fact that each new area must be treated as a separate problem. For this reason before any interpretation can be attempted a norm for that area must be established. In other words this method is comparative and results from unknown ground must be compared with results from samples taken from known areas of mineralization.

WORK DONE IN TASMANIA:

The time allotted for Dr. Sokoloff's visit was far too short to allow of any definite conclusions. Rather was it an opportunity to study the initial method of approach to a number of separate areas. Of these the results obtained from the Mt.Lyell area were the most interesting. A geophysical anomaly had been established in the northern part of the Mt. Lyell Company's leases and a series of traverses were run across this and samples taken of the schist at regular intervals. Laboratory tests confirmed the position of this anomaly but time did not permit of the establishment of a norm for the Lyell District and consequently nothing in the nature of a quantitative assessment could be made.

On the copper-nickel deposits at North Dundas two traverses were run and samples taken. In one the presence of copper was established but the other proved a blank. Unfortunately the late arrival of the nickel reagent prevented tests being made for this metal.

Dr. Sokoloff also visited Rosebery and demonstrated his method to members of the staff there. Although only four samples were taken there the management was so impressed that further work in this direction is contemplated.

Two other areas were visited at Zeehan but because of contamination, these were deemed unsuitable for investigation.

RECOMMENDATIONS:

Although this work is still in its early stages, and there are many places in Tasmania unsuitable for its application, it is felt that there is a great deal of value in it and a further study should be made. Two textbooks have been published in English on the subject. These are listed below and it is recommended that two copies of each should be purchased, one copy for the Geological Survey and one for the Laboratory.

When these have been obtained a supply of reagents should be added to the Laboratory and a planned campaign carried out by a geologist in a known area.

TEXT BOOKS IN GEO-CHEMISTRY:

"Organic Reagents in Trace Metal Determination"

E.B. Sandell 1945.

Interscience Publishers Inc.
New York.

"Organic Reagents in Inorganic Analysis"

W. Prodinger.

Elsevier Publishing Co.
New York.

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