Morning Session
Chairman G.H. Friedrich.

PRESENT STATUS AND FUTURE PROSPECTS IN EXPLORATION GEOCHEMISTRY

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The past decade has witnessed a tremendous growth in the scope and application of geochemical methods in mineral exploration. Systematic rock, soil and stream sediment surveys are now common practice. Plant analysis (biogeochemistry) and water analysis (hydrogeochemistry) have not so far found wide application, but there is a growing awareness of the potential of geobotanical techniques.

In general terms, geochemical exploration has been most successful in areas where the overburden is dominantly residual or composed of glacial material of local origin. Outstanding problems include those posed by thick transported overburden, peat-bogs and the conditions encountered in arid terrain. Furthermore, with some exceptions, the geochemical approach to prospecting for "blind" orebodies concealed beneath barren cap-rocks has not been particularly rewarding. In many of these areas, however, there can be little doubt that some solution will eventually be found as a result of continuing research in applied geochemistry coupled with complementary advances in geophysical methods and the development of fully integrated prospecting systems which, in any event, are a prerequisite for mineral exploration under any conditions.

Following recent research there is an increasing trend towards multi-element geochemical reconnaissance as a rapid means of delineating mineralised districts and provinces. The technique is particularly attractive as the results can also be applied in other fields, including agriculture, pollution and, possibly, epidemiology.

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With the growing interest in marine resources, research has now begun into the role of applied geochemistry in the exploration and evaluation of a variety of potentially economic deposits ranging from detrital minerals and phosphorite on the continental shelf to manganese nodules and metal-rich brines and muds in deeper waters.

Fulfillment of the scope for geochemistry in mineral exploration is primarily dependent on advances in sampling and analytical techniques. Colorimetry has largely given way to atomic absorption spectrometry, the use of automatic instrumentation for multi-element coverage is increasing, and exploratory work is already underway on the development of portable equipment for on-site analysis with real-time read-out for exploration both on land and at sea. Even more exciting is the possible development of air-borne remote sensing techniques for analysing volatile and particulate constituents in the atmosphere which, coupled with appropriate multiband photography and imagery and deep penetration geophysical techniques would certainly revolutionize mineral reconnaissance as we know it today.

Each advance in technique commonly tends to lead to higher rates of production of multicomponent data. In consequence, computerized systems are rapidly becoming indispensable for handling, processing and presenting the information obtained during the course of the larger and more complex surveys.

Despite increasing sophistication in technique, the ultimate effectiveness of any geochemical survey depends on the quality of the interpretation of the data in terms of their economic significance. Far greater refinement in this vital aspect of exploration geochemistry is an urgent requirement. For this, we

need to know much more about the fundamental processes affecting the distribution and mode of occurrence of the elements, the mechanics of dispersion and the influence of the secondary environment. Furthermore, the limited capacity of the human brain to cross-correlate multi-component data means that computerized geostatical aids will soon become an essential adjunct in the art of geochemical interpretation.

Finally, there is little point in developing advanced techniques for industry unless they are put to proper use. It is, therefore, vitally important that geology undergraduates should at least be introduced to the concepts and challenges of exploration geochemistry and that more opportunities should be available for postgraduate training in this field. Industry's demand for trained exploration geochemists far exceeds supply. It is the Universities' responsibility to correct the balance.

Discussion

W.L. Plüger expressed his belief that hydrogeochemical methods of exploration may well find wider application in the future. He noted that recent developments in analytical techniques, specially those relating to the determination of low trace element concentrations, are increasing the method's potential applicability.

J.S. Webb answered that special problems are encountered in the actual practice of hydrogeochemical surveys, as compared to other geochemical surveys. He did not, however, wish to deny the method's potential.