

## GEOLOGICAL SOCIETY OF INDIA

### GROUP DISCUSSION ON 'GEOCHEMISTRY OF THE PRECAMBRIAN ROCKS OF INDIA'

(8th & 9th March, 1974)

A group discussion on the 'Geochemistry of the Precambrian Rocks of India'—the first in a continuing series, under the auspices of the Geological Society of India—was held in Bangalore on March 8-9, 1974, at the time of the annual general meeting. The Society's decision to initiate, organise, and conduct such a discussion stemmed from the conviction that India's contribution to Precambrian geochemistry has been quite inconsequential considering the talents and facilities that are available in our country—a critical region for studies of the Precambrian.

The purpose of the first group discussion was threefold: (a) to review the present status of our geochemical work, (b) to identify gaps in our knowledge, and (c) to formulate meaningful research projects (both short term, and long term) involving the application of modern geochemical techniques.

The discussion was centred on nine themes: (1) contemporary global trends in geochemical studies of Precambrian greenstone-granite complexes, (2) general review of problems relating to our low grade, and high grade Precambrian terrains, (3) critical evaluation and assessment of the available isotopic age data for the Indian Precambrian, (4) review of the present status of our geochemical work on specific rock associations, namely, ultramafic-mafic, granitic-migmatitic, charnockitic, alkaline-carbonatitic, sedimentary-metasedimentary, (5) gaps in our knowledge relating to the rock associations listed under (4) above, (6) new approaches to bridge knowledge-gaps by the application of strontium and lead isotope geochemistry, oxygen, hydrogen, carbon, and sulphur isotope geochemistry, trace-element geochemistry, solution chemistry, fluid inclusion studies, experimental geochemistry, data processing through computer techniques, (7) analytical geochemistry with particular reference to elemental and isotopic analyses, (8) Precambrian geochemistry viewed from Lunar chemistry, and (9) application of fundamental geochemical data to problems of locating new ore deposits in India.

Not tied down to any rigid schedule, and held in an informal and relaxed atmosphere, the group discussion was, nevertheless, structured and conducted in several well defined, theme-wise sessions. After two days of stimulating discussions made possible by a free exchange of ideas, supplemented by serious post-discussion deliberations, the participating scientists—currently active researchers in the field—reached the following main conclusions:

(1) Although some excellent stratigraphic, structural, and petrographic work on selected Precambrian terrains of India has already been done, we lag very much behind countries like South Africa, Australia, Canada, and the U.S.A., in the field of geochemical studies of Precambrian rocks and ore deposits. This unfortunate situation should be remedied, and even reversed, without any further delay; for such studies are extremely relevant to our country's planning for socio-economic uplift because the results flowing therefrom can be applied to projects aimed at locating new ore deposits. Problems that require immediate attention are: (a) Formulation of a viable, but flexible, radiometric time framework for the Indian Precambrian based on

additional isotopic age data. Researches should be aimed at obtaining the primary ages of rocks, and of metamorphic overprints. As far as practicable, the geochronological framework should be geologically consistent. (b) Evidences for similarities, if any, between Early Precambrian (more than 2.5 b.y.) sequences of India and those of the Swaziland System, Rhodesian Belts, Pilbara System, Kalgoorlie System, and the Superior Province. (c) Nature of the Indian protocrust (sialic? mafic? anorthositic?). (d) Precambrian volcanism and plutonism in India, and evolution of volcano-plutonic complexes. (e) Nature of 'cratonization' in Peninsular India. (f) Evolution of Precambrian banded iron formations, red beds, and chemical sediments. (g) Implications of geochemical data from India on Precambrian core-mantle-crust differentiation, and on metallogeny. (h) Episodes of Precambrian glaciation. (i) Biogeochemistry of the Indian Precambrian. (j) Recognition of plate-tectonic regimes in the Archaean (more than 2.5 b.y.) and Proterozoic (less than 2.5 b.y. to 0.6 b.y.) of India, and identification of related metallogenic provinces.

(2) To achieve the objective stated in (1) above, a group of specialists within the Geological Society of India should play an active role, and provide the leadership. In this endeavour, the Society should get the maximum possible help from organisations like the Bhabha Atomic Research Centre, Atomic Minerals Division, Physical Research Laboratory, Tata Institute of Fundamental Research, Indian Institute of Science, National Aeronautical Laboratory, National Geophysical Research Institute, Geological Survey of India, and some of the Universities, where modern facilities are available for elemental and isotopic analyses, and for isotopic age dating. The possibility of availing facilities in some foreign institutions should also be explored.

(3) As the geology of selected Precambrian terrains in Karnataka and Bihar States is known in greater detail than in other parts of India, these regions—classical ones in Shield studies—should receive topmost priority in the proposed geochemical endeavour.

(4) Simultaneously, vigorous, problem-oriented geological investigations should be initiated in the other Precambrian areas, as for example, in Kerala, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, and Rajasthan, to enable intensive geochemical studies to be taken up. Critical areas in these regions should be geologically mapped in sufficient detail.

(5) The Indian Shield has not figured in intercontinental comparisons of magma types that evolved in Early Precambrian depositories because of the scarcity of chemical data on the ancient rocks of India. Such comparative studies of the Early Precambrian sequences in South Africa, Rhodesia, Western Australia, and the Superior Province of the Canadian Shield have clarified several long standing problems relating to the evolutionary trends of Precambrian lithologies. It is therefore essential that all the relevant geochemical data, presently scattered in some published, and unpublished forms, e.g., in 'departmental reports and documents', 'theses', and 'dissertations', be collated, and stored at one place for quick retrieval, as and when necessary. Modern aids for data processing, storage, and retrieval should be provided for the purpose. The Geological Survey of India should be entrusted with this task.

(6) The six hundred or so available isotopic age data for Precambrian rocks of India should be critically evaluated, and their true implications properly assessed. We should also, urgently date many more whole-rock and mineral samples from critical areas by applying all the known dating techniques. Interpretations of age

data, without due regard to the limitations of the methodologies employed in each case, should be discouraged as they would only generate ultra-confusion.

(7) The specialist group within the Geological Society of India (see 2 above) should periodically review the progress of the proposed researches and critically evaluate the results. This group should constitute the nucleus of an Institute of Precambrian Geochemistry which the Government should consider setting-up expeditiously.

The entire proceedings of the first group discussion is proposed to be published soon by the Geological Society of India.

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