

large scale F_1 fold — thus suggesting a strong structural control in localisation of the ore body. The later deformations are superposed and refold the F_1 structure of the host rock as well as the ores and are responsible for the major undulation of the ore bodies, around Mawmaram. Most of the ore minerals are crystalline and unzoned indicating that they have crystallised under equilibrium conditions. Metamorphism of the host rocks as well as arsenopyrite-loellingite-pyrrhotite/pyrite association indicates a biotite-grade of regional metamorphism.

Three test-boreholes carried out, around Mawmaram, show that the mineralisation occurs in three levels — the first level occurs with/without ferruginised layer up to a depth of 20 m, with a maximum of 25% Pb for 1.6 m, the second level around 35 m, with a maximum of 12% Pb for 0.3 m, and a third level around 65 m, with a maximum of 2% Pb for 1.5 m. These are corroborative with the borehole geophysical anomalies.

Based on Rb-Sr whole rock isotopic age of 1150 ± 26 Ma

obtained on the leucocratic granite gneiss, Ghosh (1984) fixed the maximum age of the Shillong Group meta-sediments at 1150 Ma. However, Pb-Pb age of the galena mineralisation, around Mawmaram, recently determined by Geological Survey of Canada on samples sent by the author, is 1530-1550 Ma. This, therefore, indicates the age of the mineralisation and also fixes the maximum age of the Shillong Group metasediments ~1650-1700 Ma. The isotopic date of 607 Ma (Chimote, 1988) of the Myllem Granite, which are intrusive into the Shillong Group, indicates that the tectonic domain of the Shillong Group experienced thermal reactivation producing these younger granites which are anorogenic in nature. There is evidence that both the basement and cover rocks are intruded by such anorogenic granite plutons and veins. The granites have yielded Rb-Sr whole rock cluster ranging from 885-480 Ma (Ghosh, 1991, 1994), indicating a major thermal event of crustal addition during the above period.

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RISK REDUCTION IN HYDROCARBON EXPLORATION – EMERGING TRENDS AND TOOLS*

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EXTENDED ABSTRACT

As long as hydrocarbons continue to control the global economic equation and power, there is always need to find more and more of these hydrocarbons. The demand for hydrocarbons in south Asia including India is expected to

increase at an annual growth rate of 4 to 5 % for oil and 6-7% for gas respectively.

Whenever oil prices go up, exploration activity increases and the petroleum industry gears up for serious exploration

*Lecture delivered at the monthly meeting of the Geological Society of India at Bangalore on 24 November 2004

with more investments and budgets. Hydrocarbon exploration has inherent risk associated with it. Recent increase in oil prices are likely to be the precursors of a long term trend. The demand for hydrocarbons has always made the geoscientists to apply rigorous thinking and use proper mix of technology to mitigate risk and find more hydrocarbons. The industry always looks for finding high volumes of low cost hydrocarbons. Thus exploration risk reduction is fundamental for success of any oil company.

Energy economists and planners have been predicting about the future supply and reserve trends since 1960s. These predictions have been proven consistently inaccurate as the search for hydrocarbons and the tools for search are changing and evolving rapidly.

Geoscientists still keep finding new hydrocarbons from old and mature basins, from basins which are emerging

as mature or semi-mature and also explore to establish hydrocarbons in new basins and frontiers. It is a well known fact that today's producing basins were yesterday's frontiers.

The rapid growth of technology since 1980s has helped not only to image the subsurface in more detail, predict the rock and fluid properties to a great extent but also accelerated the thinking process and understanding of the working of petroleum system. With this it is possible today to model the entire process of generation, migration and entrapment with various risk and probability factors for predicting the hydrocarbon accumulation with reasonable accuracy.

The ultimate aim and effort of applying technology and innovative thinking is to reduce the risk in hydrocarbon exploration and in turn the finding cost to a level as low as one dollar per barrel of oil.

A.B. DAS GUPTA HONOURED

The Association of Petroleum Geologists (APG), Dehradun, honoured the veteran petroleum geologist, Padmashri Amiya Bhushan Das Gupta by bestowing the 2nd APG Lifetime Achievement Award on him on 24 September, 2004 at Khajuraho, M.P. for his outstanding achievements in the area of petroleum exploration in India.

In his acceptance speech, while agreeing to the need for more scientists with specialised knowledge, he stressed on the need for integrating skills at every level to lift geology (and incidentally oil finding as well) to new heights of achievement.

M S RAO

SHANTI SWARUP BHATNAGAR PRIZES

The above prizes for 2003 in the fields of Earth, Atmosphere, Ocean and Planetary Sciences have been awarded to Dr. Guntupalli Veera Raghavendra Prasad of the University of Jammu and Dr. Kanchan Pande of Physical Research Laboratory, Ahmedabad (presently with the IIT Bombay).

Dr. G. V. Prasad has made outstanding contributions on the origin, diversity and biogeographic relationships of various Mesozoic (245-65 m.y.) vertebrate groups of India,

with special reference to Cretaceous mammals and the Late Cretaceous palaeobiogeographic reconstructions of the Indian plate.

Dr. Kanchan Pande has made outstanding contributions in providing geochronological constraints for the evolution of continental flood basalts in the Indian subcontinent, especially the Deccan, and their geological and geochemical implications.