Bangalore Puttaiya Radhakrishna

A tribute on his 75th birthday

'The truly great are not the men of wealth, of possessions, not men who gain name and fame, but those who testify to the truth in them and refuse to compromise whatever be the cost They are determined to do what they consider to be right We may punish their bodies, refuse them comforts, but we cannot buy their souls, we cannot break their spirits Whoever possesses this invulnerability of spirit even to a little extent deserves our admiration'.

– Sarvepalli Radhakrishnan

Bangalore Puttaiya Radhakrishna (popularly known as BPR) certainly belongs to this category of luminaries and I have great pleasure and pride in paying my tribute to him on his 75th birthday.

Early years

BPR was born on the 30th April 1918 at Bangalore, as the third son of Sri Bangalore Puttaiya, a well-known public figure of Mysore State. BPR graduated from the Central College, Bangalore in the year 1937 obtaining BSc (Hons) degree in Geology in First Class and securing a gold medal.

Soon after graduation, he joined the Mysore Geological Department (MGD) as a field assistant at the young age of 19.

Service in the Mysore Geological Department

The Mysore Geological Department was started by Robert Bruce Foote in 1894 as the first State Geologist and later followed by W. F. Smeeth, P. Sampat Iyengar, B Rama Rao – all stalwarts of Mysore Geology. These early pioneers were responsible for building a coherent geological history of the Precambrian of south India and for producing one of the finest and accurate geological maps of the State

BPR served the Department for 37 years and retired from service in 1974. His tenure of office as Director of the Department saw a great expansion in activities, especially in mineral resource development and the utilization of groundwater resources of the State.

Geological Society of India

BPR will be remembered for his service to the cause of geology in India. Besides being a core member of the group that conceived the idea of forming a Society in 1958 for 'improvement in the standard of geological research, by providing a forum for free exchange of ideas and media for quick publications of results and wide dissemination of knowledge', he served as the first Secretary for fifteen years and later as the Editor between 1974 and 1992.

The Society under his fostering care has developed and continues to flourish. The Journal which was issued once a year became a monthly Apart from maintaining high standards for the Journal, a series of other publications, Memoirs, Lecture Notes, Field Guide Books, Mineral Resource Series and Textbooks of Geology and Mineral Resources of individual States have been brought out

BPR has always paid attention to the organization of Symposia, Group Discussions and Field Workshops For the past few years the Annual Meetings of the Society are being held at different centres in the country to emphasize the national character of the Society and also to spot promising young talent and encourage its development

The publications of the Society have exercised a beneficial influence on the growth of Earth Science Studies in India. The Society has grown in stature and has nearly 2000 members on its roll. BPR's deep involvement and selfless service are central to the Society. We feel honoured to count him as our friend, colleague and a guiding spirit.

BPR always encouraged multidisciplinary efforts to study geological problems. The recent Workshop held at Khandala near Bombay illustrates this point very well. We then had participants from different disciplines: physics, chemistry, metallurgy, earth science, material science, electronics and astrophysics.

The distinguishing character of his approach is his remarkable independence, he was reluctant to seek governmental support for the Society

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On the contrary, he firmly believed in personal commitment involving the intellectual labour of its fellows rather than financial contributions.

Some of BPR's varied interests and the contributions he has made to our knowledge of Indian Geology can be briefly narrated.

Western Ghats

BPR was attracted to the Western Ghats, one of the most spectacular hill ranges representing the magnificent escarpment of late Tertiary age paralleling the west coast of India. He was the first to point out, way back in 1952, that the Peninsula is not a static mass unaffected by recent tectonic movements. His logical deductions pointing to domal uplift and rifting, are mainly based on physiographic peculiarities like: 'marked diversity of landscape, the youthful character of the rivers, the precipitous escarpments, the narrow gorges and the relative high elevation of the plateau compared to the plains'. He also brought out the significance of the easterly drainage of the Indian peninsula and identified cyclic erosion surfaces developed as a result of intermittent uplift.

His ideas on the evolution of the Indian Peninsula are embodied in two of his early works – The Mysore Plateau (1952) and the Western Ghats of the Indian Peninsula (1965).

Closepet Granite

During the early fifties BPR made a special study of the Closepet granite, a suite of younger porphyritic potassic granites occurring as a long linear belt traceable for more than 500 km showing the same physiographic trend as those of the greenstone belts in the Dharwar craton. He was the first to invoke the role of anatexis and partial melting of Peninsular gneiss to account for the origin of the pink porphyritic granites.

The importance of the linear disposition of Closepet granite is highlighted by its being considered as occupying a major geo-suture separating the granite–greenstone terrane of the Indian peninsula into two blocks of different crustal thickness. BPR was awarded the doctorate degree in 1954 by the Mysore University for his work on Closepet granites.

Precambrian of South India

In 1982, he delivered an address at the Indo-US Workshop on 'Archaean Granite–Greenstone Terrain of the South Indian Shield'. In this address he reviewed the present state of our knowledge about the Precambrian of South India and its metallogeny. He described the three principal rock associations which characterize the Archaean of South India – 1) the high grade granulite association, 2) the granite–greenstone association (Ancient Supracrustals) and 3) the craton–basin association (Dharwars). According to him 'In no other part of the world, perhaps, are the three associations brought together in such a well-knit composite unit as in South India affording excellent opportunities for a close study and understanding of the different stages in the evolution of the early continental crust'.

At the request of Prof. R. C. Newton, BPR along with S. M. Naqvi presented a lucid account of the Indian Precambrian crust and its evolution, which was published in the *Journal of Geology* (1986).

Suspect terrane elements in the Indian subcontinent

BPR was struck by the unique geology and physiography of the Indian subcontinent and believed that 'Great advances in science are possible with daring imagination and search for a simple design which underlies the complexity'. With his wide knowledge of geological literature, critical evaluation of data and intuition, he presented his original concept on the break-up and reassembly of different segments of the Indian continent at the Annual General Meeting of the Geological Society of India in 1987. He conceived of the Indian continent as being made of different crustal blocks, geologically unrelated to each other which were brought into juxtaposition and sutured together during different periods of earth history. According to him the land south of the Narmada, forming the Peninsular block and that portion lying north of the river, forming the Bundelkhand block represent two different terranes which were brought or sutured together during early Proterozoic.

Three billion-year-old barite

The first reported occurrence of 3 billion-year-old barite in the Dharwar basin from Ghattihoshalli, Karnataka by Radhakrishna and Srinivasaiah during 1974 is highly significant in the context of the nearly uniform sulphur isotopic composition recorded by Thomas Hoering of the Geophysical Laboratory, Washington, DC, on these samples which positively record the ancient character of the sediment similar to those from Australian, African and Siberian shields.

Crustal evolution and metallogeny

BPR has provided a masterly review and synthesis on the influence of crustal evolution on ore deposition based on a thorough survey of the important metalliferrous deposits of India (Address delivered at the Annual Meeting of the Geological Society of India, Chitradurga; *J. Geol. Soc. India*, v. 25, pp. 617–640).

Mineral development

BPR always championed the cause of self-sufficiency and the paramount need for rational utilization of our mineral resources, big or small, to our best advantage. He deprecated the export of minerals in the raw state. As the Chairman and Managing Director of Mysore Minerals Limited, he was responsible for the opening up of a number of mines for iron ore, manganese ore, chromite, kaolin, bauxite, and soapstone in different parts of the State.

Gold – The Indian scene

BPR and his former colleagues L. C. Curtis and G. K. Naidu of the Hutti Gold Mines recently brought out an informative publication on *Gold* stressing the urgent need for exploiting the numerous prospects. His recent publications give a clear insight into the rich potential there is for the development of the gold mining industry. These books form valuable additions to our knowledge and will serve as authentic reference works on the subject

Field work and geological mapping

BPR always emphasized the importance of field work right from the educational programmes to professional geological activities. Nothing can be more rewarding since 'Field activity introduces reality into earth science research. Nature can be a harsh critic, destroying elegant theoretical models with a few hard, cold facts' (*R. P. Sharp, 1988*).

Despite major emphasis on laboratory-oriented studies both at the Universities and various other Institutions, it is worthwhile recalling the prophetic words of the experimental petrologist Dr H. S. Yoder, Jr, emphasizing the basic philosophy of the father of modern experimental petrology Dr N. L. Bowen; '... re-examination of the field relations and testing in the field the principle deduced from experiment. The process is reiterated until a satisfactory interpretation results that will account for the field observations.'

BPR not only introduced the publication of Field Guide Books covering important geological areas from different parts of the country, but also made it a point to actively participate in most of the field trips, the latest one being the Chitradurga field training programme of IIT Bombay students during December 1992. It was indeed a rewarding experience for both students and faculty to have him as a field instructor in some of the remarkably well preserved stratigraphic sections in parts of the Dharwar craton where he started his career more than 50 years ago!

Utilization of water resources

BPR realized very early in his life that the prosperity of any State to a large extent depends on the wise utilization of its soil and water resources. In 1966, he organized a State Groundwater Cell in the Department of Mines and Geology of Karnataka State for the development of groundwater resources Later, he extended these feasibility studies for groundwater development in other parts of India As part of these programmes, he also investigated the foundation conditions of major dam sites – Kali, Ghataprabha, Malaprabha and Krishna, in the Karnataka State.

After witnessing an acrimonious debate on the sharing of the Cauvery waters, he focussed the attention of scientists, engineers, politicians and bureaucrats on different aspects of water conservation and best means of managing our water resources.

I am rather tempted to quote his words:

> 'Modern technology has been used in building high dams and storing water But in the matter of conveying the precious water to the field and making it available for plant growth, technology has lagged behind Accurate quantitative appraisal of resource availability, and its utilization are urgently needed Water conservation measures have to be adopted taking lessons from Israel, a country which had made a success of its agriculture Greater attention should be paid to groundwater Porous and fractured rocks below ground function as a vast interconnected reservoir This natural storage which nature has provided should be allowed to get recharged with rainwater These measures can be best attempted through the organization of autonomous River Authorities for each river basin and sub-basin' (*Current Science*, V. 65, pp 294–300, August 1993)

Again and again, he has pointed to the continued neglect of the fertile black soil resources of Maharashtra, Karnataka and Andhra, which are rapidly getting eroded and turning saline and infertile through excess irrigation.

Deccan Traps

With his life long association with Western Ghats, BPR has taken great interest in the study of the Deccan Traps. He in fact put forth most of his arguments on the evolution of the Indian continental lithosphere based on critical evidences from the Deccan Basalt Province.

He was the moving spirit behind the two International Field Workshops on the Deccan Traps held in 1979 and 1988 and was responsible for bringing out two publications by the Society which led to the renewal of interest and intensification of research on this Province with the participation of several international groups. Today 'the Deccan is one of the best studied volcanic provinces of the world and has certain features which characterize it as somewhat unique'.

Honours and Awards

Various awards and distinctions that have been conferred on BPR clearly bear testimony to the high esteem in which his contributions to science have been held, and also his untiring efforts and selfless service rendered to the advancement of geological sciences through the Geological Society of India, and his long established reputation both nationally and internationally, as a geologist of integrity, repute and courage.

He was elected a Fellow of the Indian Academy of Sciences as early as in 1956, Indian National Science Academy in 1972, Honorary Fellow of the Geological Society of London in 1986, and the Geological Society of America in 1988. The Pramatha Nath Bose Medal of the Asiatic Society, Calcutta, for the year 1990 was awarded to him for his 'conspicuously important contribution to geology with reference to Asia'. The Indian School of Mines conferred on him the Honorary degree of Doctor of Science in 1992. In 1971, he received the National Mineral Award of the Government of India. The prestigious D. N. Wadia Gold Medal was awarded to him by the National Science Academy in 1993. In the same year, in recognition of his meritorious services rendered to Science, the President of India conferred on him 'Padma Shree'. The Karnataka Sahitya Academy recognized the biography he has written on 'Raman' as the best biography produced in Kannada in 1989.

Remarkable qualities

What is unique in BPR? It is not merely his writings, but his nobility of character which 'derives pleasure at seeing the advancement of others', his courage, forthright criticism, total commitment to work and above all his love, affection and encouragement for all his associates at all levels – be he a driver, steno or a geologist.

His actions and deeds continue to promote among the younger generation of Earth Scientists a sense of self respect and a realization of the power that is lying dormant within. The culture and tradition that has been built and set in by the first Editor, Professor L. Rama Rao, was continued by BPR, encouraging original work, bringing in 'new ideas, energy and a healthy scepticism about established notions' – the essence of scientific growth.

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