B. P. Radhakrishna (‘BPR’)

Bangalore Puttaiya Radhakrishna, popularly known as BPR, who turned 92 on the 30 April 2010, has devoted more than seven decades of his life to geology. He joined the Mysore Geological Department in 1937 when he was only 19 years old, and worked there for 37 years, the last 10 years as Director. He was one of the founders of the Geological Society of India, and was the Editor of the Journal of the Geological Society of India from 1974 to 1992. He continues to write for the journal on a wide variety of topics. Some of the editorials he has written after retiring from editorship of the journal are: ‘In defence of field-work and mapping’, ‘Mineral resource development and environment’, ‘Gold scene in India and China’, ‘Rain water harvesting’, ‘Glimpses of lost Indian civilizations’, ‘The art of reviewing’ and recently, ‘India-born Nobel Laureates’.

Through these articles he reminds us of existing problems, points out unexplored areas, cautions against dilution of rigour in research, and tells us about the glorious past of our country – all for the betterment of Indian science, particularly Indian geology, and from a perspective that only a veteran like BPR can provide.

The following are excerpts from a conversation with BPR, in which he spoke about his life and work, and the world as he sees it today.

On how he became interested in geology

My father was a graduate in geology. He was a classmate of Sampat Iyengar who was a well-known geologist. Once, on his return from London, my father brought some very good, big, illustrated volumes on earth science that was of great interest to me. There were some extremely good pictures of the British landscape. That is how I got interested in geology. It was purely by chance. I was interested in those books – the illustrations. My father did not persuade me to join geology... At college, I had a wonderful teacher. His very first lecture was very inspiring, and I have never regretted having chosen geology after that.

Geology is an amalgamation of physics, chemistry and biology. It is the story of the earth, and the animals living on the earth. How they have evolved, how Man evolved... It is a fascinating history. At Central College, the biggest benefit in those days was that there used to be sectional libraries. There was no general library; each department had a full library. And to an Honours student, the whole library was open, and they gave all the keys to us. It was a great thing. There was no guidance or anything, but you had the whole knowledge before you. Two books greatly impressed me. One was Founders of Geology by Archibald Giekie, a very famous geologist, Director of the British Geological Society. Equally famous was Charles Lyell. In fact the only book which Darwin carried on his voyage of the world was Lyell’s Geology. He used to frequently refer to it. My interest in the book is because it said even the landscape that you see evolves. Even though it is a mountain today, gradually it wears down and becomes a plain, the sea rolls over it, and another series of events begin. Tracing of the history of the earth was a very, very interesting feature. That cemented my interest in geology. And luckily, I stood first in the Honours degree. Those days the annual fee was 11 rupees, and that was free for a subject scholar. They gave me some scholarship too.

[BPR’s interest in the evolution of landscapes from his Central College days was probably what attracted him to the study of geological evolution of South India, a subject that BPR has spoken and written about widely. The geological diversity of the Indian peninsula prompted BPR to suggest that this land mass is made up of different crustal blocks that are sutured together. An article written to commemorate BPR’s 75th birthday notes that BPR has also used data generated by the survey of metal deposits in India to suggest the influence of crustal evolution on ore deposition.]

On how he came to join the Mysore Geological Department

I was appointed with no application. The examiner (for the Honours degree examination) was B. Rama Rao. He sent a letter saying that I was appointed as a field assistant on Rs 75 per month. I was in dhoti even in those days. On the first day I had no trousers to wear (laughs). So my elder brother’s was made to fit me. I don’t know what picture I presented... Anyway, in my 19th year I became an officer at that Department. For nearly 37 years I have been in that Department, in various capacities. From field assistant, I became the Director, and remained in that position for nearly 10
years. I had full scope for development and I never regretted joining the Department.

[The Mysore Geological Department, now the Department of Mines and Geology, was started in 1894 by K. Seshadri Iyer, and was nurtured by great men of yore such as M. Visvesvaraya and Mirza Ismail. The Department was located in Race Course Road, Bangalore, till the building was demolished in 1996 (ref. 1). BPR was the Director of the Department from 1965 to 1974.]

BPR in 1940. Courtesy: Geological Society of India.

Geology

On his work on Closepet granite

That was for my Ph D degree. It is very striking on the geological map. The Closepet granite is some twenty miles wide and it goes like that (gestures upwards). It is very unusual (see Figure 1). So I was interested.

Mysore University then had its own rules. All the Ph D students had to come from institutes that were recognized. Our Mysore Geological Department was not recognized. So they sent some experts to see what sort of work we were doing, and then they granted that the Mysore Geological Department is an institution that can be recognized. That correspondence took one or two years. Then came the question of a Ph D guide. Who was to be the guide? C. S. Pichamuthu, who was the Head of the Department, could

be the guide? So that again led to some correspondence, and then that was permitted. By that time my thesis had already been completed (laughs).

I don’t know if you have seen a specimen of Closepet granite. It is a very pretty rock. Against a sort of a light green background, there are pink feldspars – very big feldspars. Now a lot of work has been done, but nobody does field work.

[The linear belt of Closepet granite, that apparently spans half the length of Karnataka, is made of porphyritic potassic granites. BPR was the first to suggest that the partial melting of Peninsular gneiss can account for the origin of pink porphyritic granites in this region 3.

On the Western Ghats and the Mysore province

The Western Ghats is our greatest possession, just as the Himalaya in the north. In fact, in some places, Western Ghats even beats the Himalaya – Kudremukh, for example. The sunset on the Kudremukh hills… Sampat Iyengar has written about it in his field notes.

Bangalore had a very picturesque landscape. The Mysore province is not like the rest of India – it is a plateau. It has an elevation of 3000 feet. You won’t find any other city in the whole world, of this dimension, at a height of 3000 feet. You don’t feel that you are on top of a hill, except for the climate. That is because of the recent uplift. The earth also gets up-heaved periodically. Our orthodox aged people… they say… the ashta dhagala (eight elephants), which are bearing the earth, and the kurna (tortoise) on whom it rests, take a slight shift to ease their limbs, and so these earthquakes happen, and these uplifts happen. A very poetic way of describing natural phenomena.

[BPR was one of the first to point out, in 1952, that the Western Ghats is not ‘a static mass unaffected by recent tectonic movements’, and he deduced from various evidences that the mountain range, too, is subject to domal uplift and lifting.] (See Box 1)

Figure 1. Map showing distribution of Closepet granite (in light pink). Source: http://en.wikipedia.org/wiki/File:SouthIndiaGeology.svg

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Box 1. BPR on Geology

‘Curiosity is the main driving force of science and scientific endeavour. Geologists in India have given up field mapping as a rigorous discipline. This is a most regrettable development, for it is this direct conversation with earth, familiarizing with rocks in their natural setting and developing a disposition which enables them to picture the entire history of evolution from its primordial beginning to the present day.’ (‘Do we lack in “scientific temper”?’, August 2009)⁶

‘The true function of a geological survey is to provide up-to-date information about the mineral and ground water resources and enable the State to manage these resources wisely and well. A thorough knowledge of rocks, minerals and soils through geological re-connaissance is of fundamental importance.’ (‘Travails of a State Geological Department’, August 1990)⁴

‘The physics, the chemistry and the biology of subsurface fluids in the heterogeneous earth are so complex that there are enough problems in hydrogeology to exercise the intellect of the most daring young scientist!’ (‘Hydrogeological Research’, October 1990)⁴

On ground water

I worked on different problems when I became the Director (of the Mysore Geological Department). There were these caste differences, and so a whole colony of Harijans would not be admitted to the village well. I thought we should do something about this, and we started a drilling division. We started a ground water division.

They had actually given up because our peninsula is made up of hard rock – granite. If you go to the north side, it is basalt – very hard. It is not deltaic, like the Tengore delta, or the coastal delta. Generally, in hard rock, you may get a small quantity of water, but not enough to irrigate, or use for growing crops. I wanted to disprove that. We made our own drill, and drilled shallow wells – 50 feet, 100 feet. And the cost was only about 8–10 rupees per foot. And many people took to bore wells, since sinking a well will take more money. So I said, let us put a 6 inch bore well and we made an experiment in Haveri and Dharwad. And even in the existing wells which had gone dry because of excess usage, I put drill holes from the bottom of the well, so the water would come up. Some of the wells were of large diameter – they wanted to store the water there, instead of putting a vertical tank which would cost more. Then they put a heavy pump for irrigation, and they could grow even sugarcane. So we were considered as saviours and when we went to that village, naduswaran would go in front of us (laughs). Even a little service will be remembered.

Now drilling wells has become commercial. They charge thousands of rupees per foot. And everything should be done quick, so they finish a well within one hour and walk out. The World Bank has started giving loans for drilling wells – only for drilling! So they took these loans and drilled wells. If they did not get water at 100 feet, they said, ‘let us go to 200 feet’. 200 feet is an enormous amount. And water didn’t come there because these people have taken up all the water and there is no chance of getting shallow water. So most of these drilling projects resulted in failure. The farmers have pledged their land as security. Most of the suicides in Karnataka are for well water.

In Bangalore city, water is scarce. It is on a plateau, and there is no guaranteed supply of water. It has to be pumped from a distance of 100 km, and pumped against height of 3000 feet. Knowing full well about these things, and building multi-storied buildings, having huge bore wells and turbine pumps to lift up that water, and to have a swimming pool on the sixth floor – these are criminal. And surely, maybe this year itself, we may be in for a crisis. We must stop drilling. If we keep drilling, we will ruin Bangalore. (See Box 2)

[The website of the Department of Mines and Geology says, ‘In the year 1966 for the first time Dr B. P. Radhakrishna, the then Director of Mines and Geology, initiated investigations for the study of occurrence and availability of ground-water resources in the state. The efforts of the hydrogeologists of the Department gave a great impetus to the irrigation in the dry lands of the state and also provided safe and assured drinking water mainly to the rural population of the state’; http://www.karnadu.gov.in/minesandgeology/Pages.desk.aspx]
sert. In the Vedic times, there were the Saraswati. Due to some earth movement, Saraswati became dry. It got diverted since Yamuna turned this way (towards the East), and so Saraswati was cut off and it became dry (See Figure 2). Near the Himalaya, there is a small river called in Hindi by a name similar to Saraswati. Even towards the end, near Kutch, there is a river called Saraswati, but that is dry. The theory is, Saraswati was a major river. It was 8 miles wide—it was so big. This ‘lost river’ has been a controversy for a long time. We made a few drill holes there (in what is thought to be the region through which the river flowed). We got freshwater a small distance underground. This shows it is an old river bed. It is completely covered by sand, and now it is the Thar desert. So it is purely by inference that we can say it is there—the ancient river so well described in the Veda. These are live problems. We must discuss them in our journals.

On the mineral named ‘Radhakrishnaite’

It was named by a Russian. He came to the Kolar Gold Fields for a visit and found it in the ore that he took. Russia has famous mineralogists. (Shows me a book, Glossary of Geology, in which the mineral has been indexed.) His name is Safonov. He took the specimen to Russia, and then discovered this new mineral. Apart from that place, it is not reported anywhere. He is a very fine scientist. He wanted to come to India.

[Radhakrishnaite was discovered by A. D. Genkin, Y. G. Safonov and others in 1985. Its chemical composition is given as PbTeS(Cl,S)2. It occurs alongside kolarite and cotanuite, and polished sections containing the mineral are preserved in the Mineralogical Museum and in the Mineralogy Laboratory of IUGM, Moscow.]

Reminiscences on field trips

I used to climb mountains, sit on the peak, and look into the distance. It used to be delightful.

But unfortunately, because of the British tradition, we all thought ourselves as sahebs—wearing hats—and we never used to live in a village. About a furlong away, in a shoph, we had to pitch our tents—each according to his grade. The officer in an officer’s tent, peons in a little lower one, and a separate ‘necessity tent’, which was used as a lavatory. All the servants were trained—within half an hour, our whole camp would be ready. It was a great pity because we didn’t mix with the people. We lived as sahebs, as something distant. So a lot of important information which we could have otherwise got was denied.

Geological Society of India

The beginnings

A few of us joined to form the Geological Society. One was L. Rama Rao, and then there was B. Rama Rao who was the Director of the Mysore Geological Department and my boss when I joined, and M. R. Srinivasa Rao. And there was one Iyengar—P. S. Narayana, and P. P. Krishnamurthi who was the Director at that time, and Pichamuthu. Of course it all centred around Bangalore; there was no other representative from the rest of India. We met at Narayana’s house over a sumptuous meal, and we decided on forming the Society. We wrote to 50 leading members that we want to make the Society, and all except one agreed.

On the need for the formation of the Society

Before the formation of the Society, there was the Geological Survey of India (GSI). It is a big organization. And each university had its own Department. Now, in most institutions, the Biology Department will not speak with the Physics Department because there is mutual rivalry. Like that, a GSI fellow would not speak to a University fellow. The University fellow would not speak to an IIT fellow. So there were all groups. We thought of providing a common platform where all can meet and discuss problems, and bring out a journal. That is how this Geological Society started. It had a good beginning. Everyone welcomed the idea. So for 50 years we have carried on.

[The Geological Society of India was established in 1958. D. N. Wadia, who is considered to be the ‘doyen of Indian geologists’, was its first President; L. Rama Rao was the first Editor of the Journal; and BPR served as the first Secretary. The Society, which started with 50 people drawn from various parts of India, now has a membership that runs to a few thousands. The Journal, which started off as an annual became a monthly publication in 1977, during BPR’s tenure as the Editor.]  

Memories of people

P. Sampat Iyengar

The department (in Central College) started with Paliyanur Sampat Iyengar—a famous figure. Very strict, very orthodox, with a trident namam... but very brave, very courageous, very disciplined.
He died the very year in which I entered Honours, so I didn’t meet him. But I read his scientific papers. He was not the founder, but the spirit behind the Mysore Geological Department. It was a famous department in those days.

Sampat Iyengar would spend as long as six months at a time doing field work. There is an anecdote about this – once he had gone to Kemmannundi for field work, and he had sent word to W. F. Smeeth to join him there. But when he arrived there, Smeeth couldn’t recognize Sampat Iyengar at all, because he had grown a long beard in the meantime! Sampat Iyengar had a great deal of respect for Smeeth. They have even authored a book together.

B. G. L. Swamy

We were classmates. He was in botany, and I was in geology. He was the son of a famous man – D. V. Gundappa. I remember that when he was a student, his intelligence was not known. But he became a great scientist. Unfortunately, after coming to India, he frittered it all away. He joined the Presidency College, Madras, and started drawing caricatures... But he was brilliant.

C. V. Raman

It is surprising that Raman took a liking for me (laughs). He was a very difficult person. He used to come to my office – giant strides (gestures). Long back, the Indian Academy held its annual meeting in Hyderabad and he thought he would speak on diamonds. He wanted to know how diamonds occur, how Kohinoor was discovered – all such details... So I sat through the whole day and collected all the literature on diamonds of India, and put it on my table. The next day he came and took the whole lot in his car. He read the entire literature during the night, and underlined with a blue pencil all the places where diamond was reported. He went to Survey of India the next day, purchased a map of the Krishna delta, and then identified all those places on that map. All in one day! And then he made another remarkable discovery. The Krishna River flows from west to east. It flows through this place called Srisailam, where it jumps and there is a ghat cut in rocks. He found that all these places, these blue marks, were below those ghats. So he came to a conclusion that the diamonds are contained in the material excavated by these ghats, and it is this material which has been washed up. Diamond is very scarce. In hundreds of tonnes you may get one speck. But during floods the earth breaks down and releases the diamonds. Of course, the diamonds that have been found in those places have all been taken away by Krishnadeva Raya and Nadir Shah and the British... We have no diamonds.

Raman then told me – 'I suggest that you do field work in the night. You go with a fluorescent lamp and scale the length of the ghats. And if there are any diamonds, they will fluoresce, and we can know which belt had contained them.' Somewhere between 50s and 60s, he elected me as a Fellow of the Indian Academy of Sciences, without my application. He himself recommended me.

His wife was a fine lady – Loka-sundari. In fact, if the story is true, when he was a young man, only 18–19 years old, they were selecting a bride for him. So he went with his parents, and this lady was playing a veena and singing the song 'Rama nee sannamanevar' – 'who can equal you, Ramal!' Raman immediately decided to marry her!

He was a great man. He built Current Science, Raman Research Institute... Great man.

[Apart from numerous books pertaining to geology, BPR has also authored many biographies in Kannada, such as Raman, B. G. L. Swamy, Srinivasa Ramanujam, Darwin, Madam Curie, etc. in order to ‘infuse in youth the value of education, science and culture’ (See Figure 3). His Raman won the Karnataka Sahitya Academy’s award for the Best Biography in 1989, Darwin won the award in 1997, and Madam Curie in 2001. A collection of his biographies, Random Harvest: Biographical Sketches was released by the Geological Society of India in 2005 (ref. 5).]

The world today as BPR sees it

On the influence of the West

Our journals, our education – all of it is in English. That is, I think, a deficiency with our system – the knowledge is not shared with our people, it is shared with the British or the Americans. That is the weakness of Indian science. Many people don’t believe it, especially the modern leadership. Association of British and Americans has no doubt enriched our knowledge, but it enriched only the top 1% of the society. It has not benefited the country – education has not really penetrated through the society. How will it penetrate to them? It is not like in China or Japan. There, they send you outside, and you learn English. But when you come back, everything is in Japanese or Chinese; their journals too.

We have copied only the worst but not the best from the West. Their cleanliness,
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their sense of duty. For instance, we once went on a field trip with a number of foreign researchers and we took a lunch packet, covered in a plastic cover. When we went out, we ate our lunch, and threw out the plastic. There was a Canadian lady in our field party. She picked up all the plastic sheets, neatly folded them, put it in her bag, and having come back to the hotel, deposited them in the dustbin. That is the education we lack.

Even in their Universities, the whole atmosphere is quite different. India has a history of 5000 years of intellect. So an average Indian who goes there to study, within a matter of one or two months, becomes a brilliant student. And of course, he likes that life, and money also makes the difference. There’s plenty of money. That is why I feel when we say we go abroad to seek knowledge, it is bunkum. We go for money. (See Box 3)

On the paucity of water

In our house, you could just dip a bucket in the well and get water. Ground water was so much, and it was clean. The first tap, I remember was only when I was 2 years old. Before that we had the well right in the middle of the house. Now all the ground water is sucked. There is no more ground water… You see these women with plastic pots – lots of them sitting in line. See their faces – despair, disappointment. In the same neighbourhood they will see a multi-storied building pumping up water, and you deny them a sip of water. Some dirty lorry from some place supplies water to the slum dwellers. What cruelty! How long will they tolerate it? You should think about it. And water is polluted – Ganga has been polluted to the greatest extent. In fact, if you drink ganga jal, you will be finally dispatched immediately. So, how to solve the water problem? It is not only geologists who should do it. Every scientist has to contribute.

On education

Our teachers don’t have field experience. Even in geology, we are taught from a text book. If you want to know about a waterfall, they will illustrate it with Niagara. If they want to describe a delta, they will describe the Nile river delta, as though the Kaveri and Godavari deltas are different. For mountains, we go to the Alps; they have not seen the Himalayas. The teachers must be trained. And we must give greater importance to primary education. Just building another institute may answer some purpose, but not the overall development of the country. If almost 50% of our women are illiterate even after 60 years of independence, it is humiliating.

On science and scientists

As scientists we have not done our job. We are sitting quiet with sealed mouths. Even in a journal, if you find something wrong, you don’t criticize. And if you find anything good, again your mouth is sealed. You must say something. That is the tragedy of our scientists – we don’t criticize, and we don’t appreciate.

And there is something called citation index – how many times your paper is quoted by others. Your value is based only on the citation; not by interviewing you, or reading your paper. All that they ask is – what is the index of the journal in which your paper was published, how many times has your paper been quoted by others… Otherwise you are unfit. How many of our Indian problems have you solved, what is your contribution to the betterment of the country, and how do you present your case… they don’t care. They rarely go by that. I am a loner in this. I don’t belong to the present intellectual group. They are different. Unless your paper is published in Nature or Science or some other journal with a high citation index, they are not bothered.

Even publishers of journals like Elsevier and Springer-Verlag have come. They know that India is a growing country. The market is developing. India has a billion people. So they say ‘You work on the articles. Leave the sales part
Box 4. BPR on science and research

‘There is a need to emphasize certain societal obligations which earth scientists have to discharge. A stock-taking and reprogramming of research effort appears necessary. Criticism is often heard that research in India is trying to answer questions which nobody is asking, in other words, that it is divorced from realities and has no relevance to the needs of the country as such.’ (‘Neogene-Quaternary studies’, October 1991)

‘Papers are sent to local journals, as a last resort, when all avenues at getting them published outside have been exhausted. I want to ask, “If we do not respect ourselves, how can we expect others to respect us?” ‘ (Are we really proud of our institutions?, May 1994)

‘Our scientific organizations … are spending crores of rupees of public money on scientific research, but surprisingly have grudged earmarking a little of that money on explaining what they are doing and what effect their work has on the public good. … Communicating science is as important as creating it.’ (‘Communicating science’, January 1995)

of it to us’. You need not go to a library. If you give one line on the computer and click, you get the papers you want. Nobody goes to a library. Next the newspapers will go, because nobody will give an advertisement. Everybody can see advertisements on TV. (See Box 4)

On the state of geology today

Geology has become highly laboratory oriented now. You separate each grain and put them through an instrument. You don’t even need a rock specimen today. Just give them some milligrams or nanograms, that is enough. They’ll put it through an electron microanalyser, and it will give the composition of 50 elements. You must see the occurrence in the field. My study was all mostly like that – field work. But they don’t recognize my type of research any more. In the past the Directors even frowned on bringing a microscope. You must learn on the field – that was their dictum. In fact one Director is supposed to have thrown away a petrological microscope!

Even the instruments. There are many instruments, but if a bolt gets lost, you cannot replace it. You have to call somebody and wait for a year. By that time, the instrument manufacturer will say, ‘This has become obsolete. There is a new model. Buy that.’ Raman used to say, Shah Jahan built the Taj Mahal to bury his wife. We have built so many institutes, like Taj Mahal, to bury instruments.

Nowadays, nobody wants to take literature, nobody wants to take Kannada, and nobody is interested in geology. There is diamond – India is the home of diamonds. There is gold – it is the home of gold. Now everything has been loot from India. Shah Jahan’s Peacock Throne – it’s not here. Our problem is, we do not know the value of the peacock. How will children be interested? They are fascinated even if we show them a sea-shell! When we were small, they bought us a bicycle. The first thing which my brother Gopalakrishna, who later became a mechanical engineer, did, was to pull out the individual parts and refit the cycle. It gave him so much happiness – to grease it, to fit the bearings, to arrange the balls. Now, nobody wants geology. All departments of geology are languishing for students. It is a great pity that our science has declined.


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