perhaps an adaptation to the environmental stochasticity. The species was found to be restricted in the Losar town of the Spiti valley only, as it never appeared again in any other area during further survey of the Spiti valley.

While our attention was focused on scientific parameters of this *Pedicularis* species which included observations on population dynamic studies, taxonomic aspects such as leaves, flower colour, insect visitations and collection, to our amazement, we saw a group of Tibetan women in groups carrying the same beautiful *P. bicornuta* in both their hands (Figure 2) reciting some prayers and moving towards a Kali temple which was situated at the Kunzum Pass ca 20 km from Losar.

The indigenous knowledge of the local inhabitants regarding the species was gathered, which brought to light the significance of this species in socio-religious ceremonies. The inhabitants of this area considered these plants to possess sanctifiable values and used it as a remedy against evil omen. The flowers were considered an integral offering to please Goddess Kali and get their wishes fulfilled. Further, no religious ceremony was considered to be complete without the offering of these flowers in the first prayers. The women also made garlands from the flowers to greet each other on important religious occasions and to garland Goddess Kali during festivals.

1. Garg, A. and Husain, T., *Curr. Sci*., 2002, **83**, 10–11.

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Palaeontology in India at cross roads – a comment

Science has many facets, constituting a dynamic system, and not static one. Therefore, sooner or later, a discipline reaches a plateau. The level of interest of the scientists in that discipline may be sustained for some time, followed by a gradual decline in interest, which is inevitable. The same level of interest cannot be maintained eternally for any discipline. The interest may be diverted to some other topical discipline, a normal, universal, evolutionary behaviour. It, however, does not preclude one from identifying the causes behind this state of affairs, and to take steps to resurrect the discipline, if possible.

That is what Mukund Sharma has done in his commentary 'Palaeontology in India at crossroads' (*Curr. Sci*., 2002, **82**, 913–917), with particular reference to palaeobotany, carrying over from where Srivastava (*Curr. Sci*., 2001, **81**, 1278–1279) left, though probably unaware of the latter work. Srivastava bemoans that 'taxonomy and systematic studies of plants fossils are being neglected due to an overemphasis on geological interpretations'. He could not have been more wrong. It is this importance of palaeobotany (as also of palaeontology) in geological interpretations that has sustained the former this long; otherwise the discipline would have become extinct by now. The reasons for this are not that obscure as to be undecipherable. Srivastava's account clearly indicates that Indian palaeobotanists have not yet broken free from the shell of traditional, descriptive palaeobotany and hence find themselves totally unprepared to keep pace with current and topical expectations, based on market economy, from the society. Mukund Sharma has sounded the alarm bells.

Palaeontology has had many ups and downs during its long history of about two hundred years. During the pre-Independence period, study of fossil collections made by naturalists and missionaries led to the concept of Tethys and of Gondwana Supercontinent. In the post-Independence period, many a geologist was specifically trained for palaeontological studies at the Geological Survey of India.

In India, palaeobotanical researches are mainly being carried out at the Birbal Sahni Institute of Palaeobotany, Lucknow. The Geological Survey of India and the Oil and Natural Gas Corporation have small service laboratories, suited to their internal needs. With retirement of individuals interested in botany-cum-palaeobotany, the situation in the universities has become precarious for palaeobotanical studies.

It is indeed sad and perturbing that during the last fifty years or so, Indian palaeobotanists have not been able to project their researches on the international scene, though the government and academies grant lakhs of rupees each year for attendance at international conferences. Most of their papers have an extremely poor citation index. Not more than a dozen research papers have merited citation in text-books published abroad during 1947 to 1996. A textbook on Indian fossils for Indian students is yet to be prepared. Now, with the exclusion of palaeobotanical studies from the syllabi of botany departments, such a book may not even be needed.

We are not aware if any technique for study of fossils has been developed or improved upon in India. Hurried reconstructions of some fossil plants have been presented, but none of these has been accepted as authentic. Though a lot of data have been generated on phytostratigraphy and phytogeography for different geological time slices in different basins, no comprehensive compilation is available for any single basin. The few vegetation scenarios that have been reconstructed look absurdly like botanical gardens.

Some of the reasons for this state of affairs may be enumerated as follows: (i)

poor leadership; (ii) governmental apathy in monitoring output versus expenditure; (iii) poor project planning; (iv) bloated sense of importance assigned to certain aspects (e.g. the claim to be able to predict future climates on the basis of palynological studies), (v) repetitive researches (Maithy, P. K., *Curr. Sci*., 2002, **82**, 776–777); (vi) declaration of results in anticipation of a new discovery before replicating the results (e.g. alleged find of Cretaceous palynofossils in the Early Permian Talchir Formation of Brahmini River, Orissa), (vii) lack of reading habit (absence of a well-constructed and comprehensive, easily accessible database may be the reason), and the habit to surf and browse the internet; (viii) allergy to comparative studies on modern plant communities; (ix) last but not the least, total exclusion of retired 'professional' palaeontologists from advisory, monitoring or selection procedures (according to noted statistician Calyampudi R. Rao, honoured with US President's National Medal for Science at the age of 82, 'In India, no one respects you after you retire. Even colleagues respect authority, not scholarship').

The need of the hour is to develop palaeobotany as an applied discipline (study of taxonomy and systematics is axiomatic), identifying areas of topical economic interest, to plan research strategies with teams under proven leaders and to complete the job within a fixed time period. Funding agencies need not dole out funds for projects with obscure objectives.

We suggest that the Ministry of Mines, Ministry of Science and Technology (DST), Oil and Natural Gas Corporation, and University Grants Commission constitute a working of reputed, active and retired professional palaeobotanists, palaeozoologists, coal geologists, oil prospectors and climatologists, to study the paper presented by Mukund Sharma and suggest remedial measures.

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Why neglect groundwater biology?

It is well known that groundwater is a precious resource for several vital functions such as for public, industrial and agricultural water supply. It is stored in karstic, fissured, and porous aquifers, and accounts for 97% of the world's unfrozen freshwater. On a global scale, underground aquifers provide drinking water to almost a third of the population, and irrigate 17% of the crop land to yield 40% of the food. What is, however, not known in most parts of the world is that aquifers are not merely reservoirs, but veritable ecosystems.

The dogmatic perception that the underground is an inhospitable environment to life persisted till recently. That the groundwater supports animal life came as a revelation to the public authorities and scientists in Germany, two decades ago. Subsequent investigations, mostly by Europeans, have established that the groundwater biotope or stygon is inhabited by rich and vastly diverse fauna[1]. For example, Pesce[2], while presenting a synthesis of the Italian groundwater fauna (stygofauna), recognized the following groups as dominant ones: cyclopid and harpacticoid copepods, ostracods, thermosbaenaceans, mysids, amphipods, isopods, syncarids, decapods, water mites, nematodes, gastropods, triclad turbellarians and amphipods. The sporadic groups include Bacteria, Protozoa, Rotifera, Cladocera, Archiannelida, Oligochaeta, Gastrotricha, Bivalvia and insect larvae. Hence the stygon, comprising many distinct habitats, which are more or less interdependent and/or intergrading with each other, has now come to be regarded as a promising place to look for insights into biological adaptation and speciation[3].

Stygobionts are typically small (1 mm in length when large), eyeless and colourless animals, feeding on bacteria, fungi and detritus. They have successfully adapted themselves to the dark, nutrient-poor, spatially constrained, interstitial, hypogean habitats. They have originated from their extinct/extant epigean ancestors of marine, freshwater and semiterrestrial habitats at different times and in different ways. Crustaceans such as the extant freshwater bathynellaceans have emerged from their marine ancestors as far back as the Carboniferous[4]. Similarly, many other stygobionts represent the phylogenetic relicts or the present-day witnesses of very ancient groups, which have disappeared from the epigean world.

Stygofauna play a vitally important ecological role in keeping the groundwater-bearing strata clean of organic particles brought in from the soil or surface waters[5]. They provide valuable information for assessing groundwater quality and flow, and contaminant transport[6]. Furthermore, certain ancient stygofaunal elements are of much value in the interpretations relating to the reconstruction of the earth's history[7]. Yet, very little is known about their ecology, evolutionary history, physiological and behavioural strategies, and taxocoenoses dynamics[6].

Today, increasing effects of pollution on, and overexploitation of, groundwater have become a serious threat to the stygofaunal communities. Hence scientific programmes have been launched, especially in Europe and recently in Korea, to learn more about this least known of ecosystems on earth. Stygofaunistic, distributional, and ecological work is in a well-advanced stage in several European countries. However, in India, even alpha-level taxonomy of stygofauna may be said to have not yet begun in right earnest (see Botosaneanu[1] for the few known stygofaunal records from India). Animal taxonomists in the country are yet to be convinced that the Indian freshwater stygon is a treasure house for an enchanting world of new taxa, what