

Astrology and science awareness

The indication given by the Union Minister for Human Resource Development (HRD) that the present government has no desire to drop the proposal of introducing astrology into the university curriculum, is most unfortunate. Notwithstanding the fact that scientific basis of astrology has never been established through rigorous investigation, a sizeable portion of our countrymen holds astrology in high esteem and considers it a science developed by our

ancestors. By bringing the proposal to include it into the university curriculum, the former minister for HRD earned accolades from them. Obviously, his successor does not want to earn their displeasure. Thus, political interest is given preference at the cost of rationality and we are drifting further from our aim of creating science awareness among the common people. Surprisingly enough, our fellow scientists, who were up in arms against the proposal

last time, have chosen to keep silent by and large. It seems impartiality is taking a back seat even in the scientist's community of this country.

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Interlinking of rivers: Ecologists wake up!

At a time when India is determined to go ahead with its single-point agenda of economic growth, biodiversity seems to be taking a worse beating than ever before. Of all the future threats to biodiversity that can be identified and listed, the proposal to link major rivers for combating local water deficits, is certainly the most distressing. Over the next 10 years, it is envisaged that 37 major rivers in India will be linked through 12,500 km of canals¹. Proper storage and distribution of the water thus salvaged would require the construction of at least 400 reservoirs². Notwithstanding the huge estimated cost of US\$ 100 billion¹, a number of socio-economic benefits have been promised from time to time by national leaders, development planners and engineers.

At least one scientific opinion suggests that the project will prove environment-friendly in that it will reduce air pollution by generating pollution-free hydroelectric power and provide more carbon sinks through enhanced crop production¹. At the same time, there is also the feeling that environmental services like flood control that the project proposes to offer, are not quite viable and agricultural productivity may be better enhanced through rainwater harvesting². Surprisingly, despite the widespread propaganda and debates about interlinking of rivers, ecologists have adopted the role of 'sleeping policemen'. For those who have travelled in Latin America, the above phrase would not be unfamiliar – it is a common road sign that means speed-breakers or rumble-

strips! Is that what ecologists are expected to do? Should we simply lie low and allow speeding vehicles to move on after a mere jerk? It is time that ecologists woke up to the fact that there has been little scientific concern raised about the impact of this mega-project on biodiversity.

Forty years ago when the Green Revolution was ushered in, there was no foresight of its impact on India's ecosystems and biodiversity. Even as we are beginning to understand the various adverse impacts of water-intensive agriculture on natural ecosystems and biodiversity, paths are being paved to usher in the Second Green Revolution that places a greater demand on freshwater. Water-intensive agriculture has taken a heavy toll of biodiversity in rain-fed ecosystems throughout the country. Whereas the magnitude of biodiversity loss across various other natural ecosystems has not been scientifically analysed to the extent that it could influence conservation planning, over a decade ago it was shown that birds of the semi-arid tracts of peninsular India have been locally displaced due to changes in land use that favoured water-demanding crops³. Birds, being warm-blooded and mobile, are relatively less vulnerable to changes in the local environment than other vertebrates. Adverse ecological impacts that birds start reflecting can therefore prove to be dangerously 'late signals' before ecosystems totally collapse.

India's freshwater ecosystems have nurtured some 750 species of fishes⁴, among which 230 are endemic⁵. At least 50% of the species of freshwater fishes that are

endemic to India are not found outside the limits of the Western Ghats. Many of these are taxonomically unique, being remnants of the biodiversity that evolved in peninsular India for more than 150 million years before India became part of Eurasia⁶. That the aquatic fauna of peninsular India, which is now preserved only in the Western Ghats, originated in the prehistoric Gondwanaland has become increasingly evident with the discovery of the frog *Nasikabatrachus sahyadrensis*^{7,8}.

Interlinking of rivers will affect, besides other aquatic life, fish diversity throughout the project area and beyond, by changing the depth, flow and turbidity of water, creating barriers to those species that migrate upstream to spawn, encouraging the spread of alien invasive species such as tilapia (*Oreochromis mossambica*), permitting the invasion of the hardier species of carps from the northern rivers that tend to out-compete the endemic ones or even hybridize with them and carrying disease-causing parasites and pathogens through water. If ships have carried invasive organisms along with the ballast water, how much more disastrous could the inter-basin conduits prove in the transfer of plankton and disease-causing organisms?

The freshwater ecosystems of India are a rich mosaic of rivers, streams and a variety of wetlands. India's wetlands, although largely man-made, are shallow, seasonal and often the aquatic habitats that maintain the most diverse communities of plants and animals. Even around megacities like Chennai, some of these wet-

lands support over 40 species of native fish and many native aquatic plants, including the rare *Oryza rufipogon*, a wild species of rice. The habitats that these wetlands offer are the result of a delicate transition between terrestrial ecosystems and the totally aquatic, e.g. lakes. Transitional wetlands are fine-tuned to the annual patterns of rain and drought, and easily lose their ecological integrity if the depth and flow of water are altered. The 400 reservoirs that the project envisages, will definitely alter the ecological integrity of wetlands locally.

Moreover, stagnation of water due to the building of reservoirs has favoured the spread of lake-adapted alien species such as the tilapia throughout the country in less than 50 years. Studies in lakes of Rajasthan have revealed that 60–70% of the fish biomass in such waters can be of tilapia⁹. In South Africa, aggressive species of fishes, including *Austroglanis sclateri*, *Barbus aeneus*, *Clarias gariepinus* and *Labeo capensis* have been accidentally transported through the inter-basin transfer of water. These are now a threat to the local species¹⁰.

The African catfish (*Clarias gariepinus*) is at present introduced and widely cultured in India. Pathological studies have shown that the species is more prone to be a carrier of bacterial infections than the native *Clarias batrachus*. Eighteen species of infectious bacteria

have been isolated from the African catfish as against three in the native Indian species of catfish⁹. Major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) that are found throughout south India are those that have been introduced from north Indian rivers. These carps were earlier known to hybridize only in aquaculture⁴. The existence of natural hybrids of *L. rohita* and *L. calbasu* has been recently confirmed in Indian waters⁹.

Against this backdrop, the plan to interlink major Indian rivers has to be put through more serious ecological scrutiny. The National Bureau of Fish Genetic Resources had initiated a programme to conserve fish genetic resources throughout the country. As part of this initiative, two fish sanctuaries have been identified in northwest India⁹. However, the greatest diversity of Indian fishes lies in the south and locally in the Western Ghats. Linking the rivers that flow out of these hills with the other peninsular and north Indian rivers without rigorous evaluation of the ecological impacts can prove disastrous not only to the fish, but also to the many intricately linked biotic processes that have evolved over the past hundred of millions of years¹¹. Ecologists please arise. We cannot be sleeping policemen!

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NEWS

Landslides at Karnaprayag: Another Uttarkashi in the making?

A sudden change in the slope profile, particularly by landslides, has often produced disastrous results in the Himalayan valleys. This phenomenon has been investigated thoroughly¹. The Uttarkashi landslide of 2003 had caused widespread damage in many parts of the township². Preliminary signs of landsliding have been observed by the author in the vicinity of Karnaprayag township, Chamoli district, Uttaranchal that has the potential of turning into another Uttarkashi in the near future. The small township of Karnaprayag is situated at a height of 788 m at the confluence of Alaknanda and Pindar rivers on the Haridwar–Badrinath National

Highway-58. Field investigations have revealed that some localities of the town, viz. Upper Bazar locality above Karnaprayag–Simli road, Kotwali and Police Colony and parts of Bhergaon above Karnaprayag–Nauti road south of Pinder river are highly vulnerable to landslide hazard (Figure 1).

A translational debris rock slide has developed in the immediate downslope of Upper Bazar locality in Karnaprayag. The period 2002–2004 has witnessed upslope extension of this sliding activity. In 2002, the active slide scarp was about 20 m away from the residential area of Upper Bazar, but during the rainy season

in 2003, the head-ward shift of the slide scarp had brought this slide zone to as close as 10 m of the residential area just above (Figure 2a). This area is already showing evidence of gradual subsidence such as visible cracks on the road and buildings, some of which even show slight tilting. In the event of further upslope extension of the slide scarp, the immediate upslope area of Upper Bazar can experience rapid subsidence (Figure 2a). Several buildings, including 18 houses, a temple and a mosque in the Upper Bazar locality are at high risk as these are immediately above the head scarp of the active slide zone.