In this issue

Medical research in India: In need of intensive care

The availability of the *Science Citation Index (SCI)* databases has spawned an enormous variety of studies of science and scientists. It is now possible to generate all manner of data on publishing scientists, journals and disciplines. In this issue (**page 912**), Arunachalam asks the question 'How relevant is medical research done in India?' To answer this, the author turns to the *Medline* database and not the *SCI*, because during the period under study (1987–1994), the latter covered only a *single* Indian medical journal – a commentary both on the *SCI* and the perceived standard of most of our medical (and indeed all science) journals. Can searches for 'Indian' papers yield correct results? Arunachalam describes the inclusion of all possible Indian cities in 'address fields' for computer searches; a process that provides him a respectable number of publications for analysis. He then proceeds to draw many important and provocative conclusions. In particular, as compared to agriculture, medical research in India appears to be limping and off target. This is hardly surprising since biomedical research has never been a major thrust in our medical institutions, with one or two important exceptions. The jealous guarding of 'turf' in medical colleges and higher institutions by medical degree holders has ensured that basic science, an important pre-requisite for creating a research ambience, is largely excluded from the teaching of medicine. Pharmacology, microbiology, immunology and genetics are the step-children in medical course lists, leading to the production of a large number of clinicians with only a limited appreciation of the capabilities of modern science in biomedical research. The spatial separation of research institutions and hospitals hinders fruitful interactions between researchers and clinicians. This gulf has hindered the growth of modern biology in India directed towards the purposeful attack on problems of local importance. Few lessons have been learnt from the burgeoning biomedical research enterprise in the West. Ironically, the Indian Council of Medical Research (ICMR) is chronically underfunded, struggling to maintain a laboratory network which is hardly suited to the demands of modern science. Fortunately, both CSIR and DBT appear to be moving towards shoring up biomedical research, although an infusion of funds is hardly likely to bring about the attitudinal changes that appear necessary.

While Arunachalam's critique may hardly be music to the ears of the medical establishment, there is no doubt that it must be heard. In a perceptive commentary, Valiathan (**page 911**) points out that the 'poor correlation between major health problems and the preferences of investigators has reasons which go deeper into the history and evolution of medicine in India'. He concludes that 'India welcomed western medicine in the nineteenth century and quickly learnt to use its tools and methods without bothering to learn how to make the tools and methods. This failure, like a birth defect, became a handicap and ensured that successive waves of tools and methods from the West, and not societal needs, determined the medical agenda in India. In many ways, this is reminiscent of Indian scientific research in general: it remained aloof from the people and failed to power our socio-economic development which continues to progress by infusions of foreign knowhow.' While any critical analysis of medical research (or indeed of any other area) will be bound to attract comment, in an environment where criticism is hardly ever construed as constructive, it is clear that with the increasing availability of bibliometric tools this is unlikely to be an isolated exercise.

P. Balaram

Evolutionary ecology

Spectacular advances in our understanding of the molecular mechanisms of life processes have legitimately led to a feeling that we now understand the logic of life. It turns out, however, that the molecular logic of life does not always enlighten us sufficiently about how whole organisms behave. Evolutionary ecology is emerging as a new way of understanding the logic of life at various levels of biological organization. This is an area in which Indian scientists have a particular advantage because of our rich biological diversity and because there is relatively less need for expensive and sophisticated technological inputs for its pursuit. This issue of *Current Science* carries a special section (**pages 923–956**) on evolutionary ecology, based on papers presented at a symposium held during the 62nd annual meeting of the Indian Academy of Sciences at Jodhpur in November 1996. The six papers in this section – chosen to represent diversity, plant and animal, vertebrate and invertebrate, theoretical and empirical – provide a glimpse of the growing attention that evolutionary ecology is receiving from biologists around the country.

The love life of frogs is a favourite topic of study for ethologists. The use of loud and noisy calls by the frogs adds to the fascination of the subject. Perhaps because of the nearly exclusive contribution to the field by male scientists, frog courtship has largely been considered to be a male-dominated affair. The calls given by male frogs to attract females, have been subjected to very detailed analyses.

Long hours of observations in the marshes of North Eastern India have now begun to show that female frogs play a no less decisive role. Their calls may be feeble but appear to be no less clear in their meaning. On **page 923** Debjani Roy provides a lively description of frog courtship, based on 358 days (nights, really) of observations.

A bat will swoop down in complete darkness and make no mistake in picking up a frog before you can blink your eyelids. Animals often perform such feats that challenge our imagination. Systematic phenomenological investigations often make animal behaviour less mysterious but no less impressive. Persistent and meticulous investigations of the question of how bats detect their prey demonstrate that bats employ contrasting methods of catching their prey in land and in water. To catch frogs on land, bats use a passive 'listening in' method but to catch a frog in water they use an active 'echolocation' method. On **page 928**, G. Marimuthu shows why stationary prey insures life while moving prey ensures death in the world of bats.

Cooperation and conflict are inseparable components of biological organization. The theoretical understanding and empirical demonstration of substantial conflicts between parents and their offspring have been major achievements of modern evolutionary ecology. We have now begun to realize that the same rules apply even to the apparently 'passive' plants and that the various hormones produced during plant growth and development can be interpreted as modulators of parent–offspring conflict and cooperation. Arguing that though they can neither sing nor dance, plants indulge in sibling rivalry, fratricide, and kin cooperation as intensely as animals do, on **page 932**, R. Uma Shaanker and K. N. Ganeshaiah continue their crusade for the cause of plant ethology and sociobiology.

While male and female flowers are produced on different individuals in dioecious plant species such as the *Papaya* for e.g., most plants are hermaphrodites – with anthers and stigma in the same flowers or at least with male and female flowers on the same tree. Nature seems to have evolved a bewildering array of mechanisms to help avoid self-fertilization in such monoecious species. Temporal dioecy or the separation of male and female flower production in time is one such strategy. Studying populations of *Bridelia retusa*, a member of the family Euphorbiaceae in the Bhimashanker wildlife sanctuary near Pune, Renee M. Borges and her students find that this species has the habit of changing sex (of its flowers) repeatedly between male to female and vice versa. What is the evolutionary advantage of such varying gender? See **page 940**.

It is reasonable to assume that the currently observed phenotypic variation in any organism is the combined effect of its ancestry, random genetic drift and natural selection (past and present). But what are the relative contributions of these various factors? The answer usually is anybody's guess, but with two exceptions. R. E. Lenski and coworkers have used the bacterium *Escherichia coli* while Amitabh Joshi and co-workers have used the fruit fly *Drosophila melanogaster* to make an explicit attempt to apportion the observed phenotypic variability between the above mentioned factors. Being a sexually reproducing organism, *D. melanogaster* exhibits, compared to *E. coli*, a smaller effect of history and a higher rate of adaptive evolution – differences that A. Joshi (see **page 944**) rightly attributes to the role of genetic recombination.

Competitive selfishness is the corner-stone of natural selection but we see many instances of the evolution of cooperation and even of altruism in the animal kingdom. Ants, bees and wasps are prime examples of this phenomenon. Understanding the evolutionary forces that promote the evolution of altruism has been a major obsession with evolutionary biologists in recent times. The direction of evolution from the selfish, solitary state to the altruistic, social condition has usually been thought to be irreversible. Recent studies on honey bees, halictine bees and ponerine ants lead to the hypothesis that nature has indeed rewound the tape. Understanding the emergence of selfishness in a group of altruists, promises to become a whole new field of inquiry (see **page 950**).

Raghavendra Gadagkar