In this issue

Modelling intellectual disparities: Implications for brain drain

The migration of highly qualified, trained and competent professionals from their place of origin to other regions in search of better employment opportunities is recognized to be a common occurrence across the world. Aptly labelled as 'Brain Drain', this phenomenon has been a subject of considerable debate in India for more than half a century. A particularly interesting analogy was drawn by a biophysical chemist while describing movements of charged molecules along a potential gradient; he described it as the movement of scientists and engineers along the affluence gradient (and incidentally proceeded to demonstrate it by personal example). While the advantages of such a move to those who make it are clear, the consequences to the two countries are not easy to assess. By and large, the country of origin suffers and the host reaps the benefits (but not always; it has been said that the brightest students of country *X* migrate to country *Y*, thereby decreasing the average IQ of both the countries—names of countries withheld for obvious reasons). The impact also varies greatly from field to field. For example, the recent crop of young software professionals has been bountiful enough for India to generously contribute to the rest of the world without experiencing noticeable scarcity in the country. On the other hand, after searching very hard in the country for individuals with Leadership Qualities, some Noble Souls have made (and announced) the startling discovery that the worthwhile stock of an entire generation had been drained away—a finding (not unexpectedly) hotly challenged by many other undrained brains (in a remarkable display of artificial intelligence, the spell-check program suggested that the word 'undrained' be changed to 'untrained'). Overall, then, what exactly has been the impact of Brain Drain on India? In the thought-provoking article on **page 593** of this issue, Gangan Prathap describes his long quest for developing a reasonable mathematical formulation of the problem of brain drain.

Laser isotope separation

In the 1940s, the Manhattan Project, considered electromagnetic, gaseous diffusion, centrifuge and liquid thermal diffusion techniques for separation of the isotope ^{235}U from the remaining isotopes in uranium, as it was crucial for developing an efficient explosive. Subsequent decades saw much work on separation of other isotopes of an element from the remaining isotopes for applications in energy, medicine and industry sectors also. An efficient new technique, referred to as Laser Isotope Separation (LIS), came into vogue in the 1970s. 'The (LIS) technique is based on the fact that different isotopes of the same element, while chemically identical, absorb different colours of laser light. Therefore, a laser light can be precisely tuned to ionize only atoms of the desired isotope, which are then drawn to electrically charged collector plates.' In the 1990s full-scale pilot plants in USA based on LIS demonstrated that this technology was cost-effective and environmentally friendly compared to gaseous diffusion plants for the same yield in enrichment. Further work has shown enrichment by LIS of isotopes of certain rare earth isotopes used in nuclear power plants and isotopes in medical diagnostic kits and health-care are economically very beneficial.

On **page 615**, P. Ramakoteswara Rao gives an account of research efforts carried out in this area over three decades at the Bhabha Atomic Research Centre, Mumbai by a team of scientists and engineers drawn from various disciplines. He has described molecular and atomic LIS approaches and has covered developmental efforts related to, in particular, the atomic vapour-related LIS technique and the results obtained.

Radiogenic heat production in central India

It is generally well known that granites, enriched with uranium, thorium and potassium contribute to the bulk of radiogenic heat production. It is also well known that heat production varies even among granites, based on their composition, degree of fractionation and intensity of alteration. So, can the estimates of heat production be used to explain the thermal structure and evolutionary history of the continental crust? The paper by Menon *et al.* (**page 634**) is an effort in that direction. Their work based on observations from two types of granites from central India, the Bundelkhand and Bastar granites, suggests how depreciation of radioelements can occur with aging and how large-scale crustal differentiation and mixing of melts may decide the constitution, and therefore the relative heat production among various granites. Along with the newer tools such as seismic tomography and receiver functions that are now in vogue, efforts like these will provide the basic insight on the nature of the crust.

Transverse faults in the Kachchh basin

The architecture of the Kachchh region has evolved from two major tectonic episodes—the Late Triassic–Early Cretaceous rifting and the Late Cretaceous, post-collisional stress reversal, leading to the end of rifting. Landforms of the region carry imprints of both these tectonic episodes. The major E–W faults formed by extensional tectonics express themselves as impressive geomorphologic features, but there are many hidden, reverse faults, whose existence is known only when large

earthquakes occur on them. The E–W faults are displaced by numerous transverse faults, which have deflected streams and generated sag ponds through lateral movements. Maurya *et al.* (**page 661**) discuss the significance of transverse faults in the Kachchh region and their role in contemporary tectonics. The Bhuj earthquake triggered coseismic movements on some of them, leaving an important question whether signatures of past earthquakes could be preserved on these faults. In a region like Kachchh where primary surface ruptures are generally absent, these structures may serve as good pointers in the search for palaeoearthquakes.