In this issue

The earth's quaking quality

The outer, relatively colder, brittle lid of the earth on which we live, is constantly stressed by a convecting interior. It is accordingly divided into long narrow zones of tension and consequent rifting above the ascending limbs of convection and of compression over the descending. The latter causing convergence, force rock sheets to fracture and slip, one over the other (thrust). In the brittle part of the crust, overthrusting takes place by catastrophic slips over rupture planes that can measure up to tens of thousands of kilometers, releasing, of a sudden, strain energy accumulated over hundreds and thousands of years, thereby producing an earthquake. This is the self-same process that progressively builds relief in the zones of convergence raising mountains (conversion of potential energy). The remainder of the stored energy minus that converted into heat at the interface, is propagated inside and around the earth as waves that shake the ground according to their amplitudes. If the earth materials were perfectly elastic, the wave amplitudes will fall with distance in a predictable manner because of geometrical divergence. In the real earth, they additionally suffer dissipation due to processes of solid and viscous damping collectively known as internal friction and measured by a quality factor called Q, which is the fractional energy loss per cycle or wavelength. The quantity Q of a given region of the earth thus signifies departure from perfect elasticity, and determines how efficiently or otherwise the wave energy will survive with increasing distance. A knowledge of this quantity characterizing the intervening rock regimes between an earthquake source and a given site is thus of paramount importance in estimating peak ground motion amplitudes that a site might suffer in a fracture earthquake. It thus finds its way into the design of building codes for earthquake-resistant structures. The reported damage caused by the moderate Chamoli earthquake at sites as far as Delhi across the Ganga–Yamuna plains for example, has raised considerable concern about the high value of Q (efficient energy transmission) of the rocks beneath these plains that conduit the wave energy from the mountain front source of earthquakes to sites right across. Unfortunately, there have been very few experimental determinations of Q for specific Indian regions using hard data and analysis. In its absence, there has been a tendency by design engineers to underestimate damage by assuming low values of Q. (For example the high power Tehri Committee assumed Q in the Himalayas to be 50.) In this issue, Dinesh Kumar and Khattri (**page 748**) present the average Q_S value for shear waves (the more damaging ones because of their larger horizontal components) in the crust and uppermost mantle beneath the Ganga plains as being over 1000. This should draw attention to the rather high quaking quality of the Indian crust and caution us about the potentially larger ground shaking that could occur at sites even at distances of over 200–300 km from an earthquake.

V. K. Gaur

Highly sensitive magnetic sensors

Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam has been working on a program to develop DC Squids of Nb–Al_2O_3–Nb for nearly a decade now. DC squids with characteristics as good as the ones made abroad have been reproducibly fabricated using electron beam evaporation under UHV conditions. Photolithographic patterning has been made down to 2 micron size. All electronic circuits have been built inhouse. The squids have been tested for their performance. Arrays of Josephson junctions have also been made.

M. P. Janawadkar *et al.* (**page 759**) have described this successful program at IGCAR with a short introduction to SQUIDS, and with a short section on three applications which are currently being developed at IGCAR. Careful planning and execution of these has made this a success story.

R. Srinivasan