In this issue

Unparalleled

The impact of computing power on science and engineering is increasing in magnitude. Advanced computing now makes possible extremely complex calculations, including those in general relativity, aerodynamics, meteorology, geophysics, molecular dynamics and crystallography. The traditional view of computing, after Babbage, Turing and von Neumann, which is based on a single central processing unit, restricts performance by requiring calculations to be made one by one. While new computer designs, materials and hardware have resulted in considerable jumps in performance with every generation of computers—the four generations thus far are identified by the basic components of the computers, viz. vacuum tubes, transistors, integrated circuits and very-large-scale integrated circuits respectively—, it is becoming clear that despite further improvement along similar lines, the 'traditional' computers are reaching the limits of performance. Parallel architecture, which means parallel execution of several operations, clearly removes this performance bottleneck. The fifth generation of computers will include powerful parallel, or concurrent, computers. The concept is not new. The first such machines were built in the sixties and seventies, and even the familiar mainframe computers have some degree of 'invisible' parallelism in execution of tasks. Explicit, user-level parallel architecture will not only increase computing power and speed, but also broaden the scope of problems for computer solution. Parallel computers will also be less expensive to build, and do not require sophisticated, custom-designed technology.

Several groups in India are developing parallel computers. The National Aeronautical Laboratory announced Flosolver in 1988. On **page 982** of this issue K. Neelakantan *et al.* of ANURAG report performance characteristics of a 4-processor and an 8-processor parallel configurations. The design the group has chosen is the hypercube topology, in which 2^n computers are connected like a cube in n dimensions, i.e. each computer is connected to n others. The hypercube has been shown to be very useful for a number of reasons. ANURAG's PACE-4 and PACE-8 are 'pilot models' intended to lead up to a 128-processor system. The ANURAG group has used a well-known benchmarking program to obtain speed ratings. PACE-8 achieves a measured speed, without sophisticated floating-point acceleration, of 1.68 MFLOPS, and a speedup, which is the ratio of the performance time, for a given problem, of a single processor to that of a concurrent processor, of 7.5.

Indoor radon

Of the natural terrestrial sources of radiation, radon and its decay products constitute the largest fraction. Radon-222 is formed by radioactive decay of radium-226, which is a ubiquitous trace-element isotope in the earth's crust. Radon-222 diffuses from its site of generation and enters the atmosphere, both outdoors and within buildings, where it is measurable. It decays into other radioactive species that can get deposited in the respiratory tract upon inhalation. It is believed that exposure to the decay products of radon is associated with increased risk of lung cancer. Many studies have measured radon in indoor and outdoor air, soil and tap water. In the first set of measurements of indoor air radon in India, T.V. Ramachandran *et al.* found (see **page 979**) seasonal variations in radon levels. The study involved measuring indoor radon by a passive technique in 800 houses located in areas identified as high natural radiation background areas and in 1200 houses located in normal background areas. Ramachandran *et al.* also measured soil radium-226 in samples in the neighbourhood of the houses and looked for correlation between indoor radon and outdoor soil radium. They conclude that the two are not necessarily correlated and that meteorological and other factors influence radon entry into houses.

The US Environmental Protection Agency (EPA) has recommended that all dwellings with radon in indoor air higher than 4 picocuries per litre ($= \sim 150$ becquerels per cubic metre) take corrective action. This criterion is being debated in the US, and a recent study presented at the last meeting of the American Chemical Society concluded (see *Chemical and Engineering News*, Sept. 17, 1990, p. 23) that concern about airborne radon has been excessive whereas the greater risk from waterborne radon has been ignored. The same study also found seasonal variation in indoor air radon, with a positive correlation between rainfall and indoor radon.