In this issue

Random numbers

The notion of a 'random number' is of interest to scientists in a wide variety of disciplines, and is also the subject of philosophical speculations. This issue carries an article by K. R. Parthasarathy (**page 904**), an internationally renowned expert in probability theory, discussing some properties of random numbers.

It has been observed that population sizes of certain animals show peaks every 3 years, on the average. Parthasarathy's article starts with a quotation from C. R. Rao, which outlines a simple probabilistic explanation for this phenomenon. The article goes on to examine in more detail the following question; if $\xi_1, \xi_2, \ldots$ is a sequence of random numbers uniformly distributed in the unit interval [0, 1], what is the average length of time between successive 'k-peaks'? Here, ξ_n is a k-peak if it is greater than its k immediate predecessors or successors (that is, ξ_n is greater than any of $\xi_{n-k}, \xi_{n-k-1}, \ldots, \xi_{n-1}, \xi_{n+1}, \xi_{n+2}, \ldots, \xi_{n+k}$). The answer is shown to be $2k+1$, which for peaks (i.e. if $k=1$) reduces to 3, as pointed out by C. R. Rao. This is a consequence of an analysis carried out using the individual ergodic theorem of Birkhoff, and the Central Limit Theorem. The analysis also yields large sample tests to check if a given sequence of numbers is random.

V. Srinivas

Sample compositional model of the earth's inner core

The earth's core is the region extending from 2890 km to the centre at 6371 km. Several models exist to explain the composition of the earth's interior which is not available for direct observation but has to be inferred from a variety of disciplines. The outer part of the core is considered to be in liquid form since it does not transmit shear type of earthquake waves. The inner core is believed to be solid with a density of about 13.

It is commonly assumed that the core consists of iron and nickel, much the same composition as the meteorites. Various types of evidence point to iron being the major component of the core. Saxena (**page 914**) reviews some of the new techniques of heating solids with a laser at ultra high pressures in a diamond anvil. The new data lend support to a simple model of the core which is identical to that of iron and stony meteorites, the debris derived from differentiated broken-up planetary bodies. The density of such material seems to compare well with the seismic density. The reason why the outer core is in liquid form is explained to be the result of the phase transformation in iron and its melting behaviour.

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