In this issue

Characterization of clay bound organic matter

Soil organic matter (SOM) through intimate associations with clay particles forms clay bound organic matter (CBO), which contributes mainly to long-term stability of SOM in most soils, and hence to more meaningful C sequestration. The formation and stabilization of CBO is a complex process and studying the composition of the CBO requires sophisticated advanced scientific equipment. Ratnayake *et al.* (**page 763**) report an attempt to characterize the CBO of a soil in terms of the other SOM fractions such as fulvic fraction (FF), humic fraction (HF) and fine soil litter. They use data of the simple weight loss on ignition (LOI) method, and calculate rate constants (k) of the oxidation reactions of the SOM fractions during the LOI. Then they use the k to calculate activation energies of the oxidation reactions, which will be subjected to a regression analysis. The results indicate that the CBO of the soil is composed of a mixture of decomposing fine soil litter and the FF, as also proposed in the available literature. The method describes a rapid and simple technique that can be applied easily. Further, the quantification of the CBO, being a very stable SOM fraction, is important in future studies on C sequestration potential of soils.

On the mathematical significance of the dimensions of the Delhi Iron Pillar

A new dimension in metrology of the Indian subcontinent has been revealed, for the first time, in the article highlighting the mathematical significance of the dimensions of the Delhi Iron Pillar (**page 766**). Balasubramaniam presents evidence that the unit of measurement used in the planning of Harappan civilization settlements is also realized in the dimensions of the Delhi Iron Pillar. This important finding, therefore, establishes the continuity of study of science of measurements from the Harappan civilization (3000–1600 BC) down to the Gupta period (320–600 AD), an almost continuous unbroken tradition stretching more than 2400 years. Balasubramaniam has re-analysed the dimensions of the 1600-year-old Delhi Iron Pillar by considering the traditional Indian unit of measurement, *angulam*, to be 1.763 cm and further 108 *angulams* made one *garhapatya dhanus* (=190.4 cm). The low percentage errors between the theoretical prediction of relative dimensions of the Delhi Iron Pillar, based on these units, and the actual measurements provide firm support to the conclusion. In addition, the significant mathematical ratios embedded in the relative dimensions of the pillar

have also been explained. Analysis of dimensions of the characters of the Gupta–Brahmi inscription reveals the possible use of the decimal system. The close association of the basic unit of measurement and the mathematical ratios in case of the Delhi Iron Pillar with those of the Harappan civilization offers evidence for continuity of scientific ideas and traditions from the Harappan civilization to the Ganga civilization.

Geological evolution of the Caribbean plate

The Caribbean presents a scenic beauty with the ambient setting of some of the islands of Greater Antilles and Lesser Antilles which is a consequence of plate tectonics. The Caribbean and the surrounding areas are one of the actively studied regions by different national organizations. The strike-slip fault passing through Cayman ridge-gulf forms the late boundary between the Caribbean plate and the north American plate. The evolution of the Caribbean plate is complex and is debated strongly. One of the crucial issues is the origin of 15–20 km thick submarine basalts (120–65 million years) on which two divergent models are proposed. The Pacific model links the Caribbean flood basalts to Galapagos hotspot in the Pacific while the Atlantic model proposes an *in situ* mantle plume in the Caribbean. In recent years the mantle plume hypothesis has been debated to explain large igneous provinces (LIPS) such as the ocean island basalt of Hawaii or the continental flood basalts of Deccan or the oceanic plateau basalts (OPB) of Ontong-Java, etc. The importance given to the study of the basalts vis-à-vis the mantle plume can be understood how a study of the basalts (60–50 million years) of Cayman trough of the Caribbean is being attempted. To quote a recent report (*The Hindu*, Chennai dated 14 August 2008, p. 24 with a pictorial note), a British team from the National Oceanography Centre equipped with a new unmanned robot submarine – is set to explore the world's deepest undersea volcanoes down to 5000 m in the Cayman trough beneath the Caribbean. A review of the framework of plate tectonic setting and some critical aspects particularly the affinity of the Caribbean thick basalts with other OPB favour the Atlantic model with the *in situ* mantle plume. See **page 736**.

Short laser pulse in a plasma

A short laser pulse propagating through plasma imparts relativistic velocity to electrons. The relativistic response produces nonlinearities which affects the propagation dynamics of the laser pulse. As the group velocity is a function of frequency and pulse strength, the front portion of the pulse where amplitude is progressively increasing, acquires higher group velocity and moves faster than tail portion, whereas amplitude steadily decreases. As a result, front portion of the pulse is expanded and tail portion is compressed. These effects become more prominent as the pulse energy increases. A theoretical formalism is developed by solving the nonlinear wave equation to study the self-distortion of a one-dimensional, circularly polarized and Gaussian, both spatially and temporally. See **page 760**.