Mathematics, infinity, and cosmos

C. K. Raju*

Abstract: Orientalists saw India as spiritual. However, Indian *gaṇita* was entirely practical over a 3000 year period. In contrast, Western mathematics was spiritual. Deriving from *mathesis*, it involved beliefs about soul and cosmos. Socrates questioned the slave boy about geometry to demonstrate mathesis as a way to wake the soul and make it recollect its knowledge from previous lives.

Early Christianity had the same notion of soul, but the church later cursed it along with the belief in past lives, when it banned mathematics and philosophy in the 6th c. CE. Mathematics was accepted back during the Crusades, minus its spiritual ideas, and purely as a tool to teach reasoning and persuasion useful to the church. Western philosophy incorrectly supposed that metaphysical deduction is certain and universal, and superior to empirical proof, or induction. However, deductive proof varies with logic which varies with culture and physics as in Buddhist, Jain, and quantum logic. Consequently, theorem-proving mathematics is not universal, unlike practical mathematics.

Europeans tried to understand gaṇita as mathematics when Indian arithmetic, trigonometry, and calculus went to Europe. A key problem related to the infinities of the calculus. Newton mistakenly thought he had resolved the problem with his doctrine of fluxions, which made time metaphysical, and supposed that it *flows* smoothly. Newtonian physics *hence* failed and had to be replaced by relativity. Nevertheless, Western mathematics was globalised by colonialism, and it is today taught that the infinities of the calculus can *only* be handled by set theory, and by supposing that time *must* be like the "real line"!

Indians, who first solved differential equations in the 5th c., later summed infinite series by order counting. This rigorous process involved a novel notion of discarding "infinitesimals". Indians treated polynomials like numbers, and ratios of polynomials like ordinary fractions. (On formal mathematics, such rational functions *are* like fractions, except that the "field" they make is "non-Archimedean" and admits infinitesimals and infinities.) This makes "limits" non-unique or *inexact* (up to infinitesimals). Acceptance of inexactitude, by discarding (or zeroing) the "negligible", is the key to Buddhist *śūnyavāda*, which rejects ideal notions as erroneous simplifications, incapable of grasping an ever-changing reality, where a unique entity does not exist for two instants. Zeroism is a de-textualised version of this philosophy, which enables the calculus to be taught rigorously (and easily) without limits, today.

Curiously, this down-to-earth and practical philosophy of mathematics, coupled with the rejection of the Western metaphysical ideas of time coming down

*School of Mathematical Sciences, Universiti Sains Malaysia, email: ckr@ckraju.net

from Augustine and Newton, leads to a *better* physics. This new physics is *non-mechanistic* and admits spontaneity (as distinct from chance) as real, allowing a better physical model of biological organisms. Even more curiously, while the underlying notion of time, in this new physics, is locally similar to Buddhist *paticca samuppāda*, globally it allows (but does not guarantee) the physical existence of a quasi-cyclic (time-reversing) cosmos of the kind assumed in the Upaniṣads or the mystery or the sūfī tradition.