

Practical Gaṇita vs Religious Mathematics

C. K. Rajuⁱ

Abstract: Plato/Socrates in *Meno*, linked mathematics to soul arousal, and deprecated practical mathematics, as celebrated in *ganita*. The post-Nicene church officially cursed Plato's "pagan" notion of soul in the 6th c., hence initially banned mathematics. Its quadrivium continued to deprecate practical mathematics. Hence, for practical use, Europeans repeatedly imported Indian *ganita* (10th to 16th c.), starting from elementary arithmetic and going on to algebra, trigonometry, calculus and probability. However, they failed to fully grasp Indian *ganita*: from Gerbert (10th c.) through Fibonacci (13th c.) to Augustus De Morgan (19th c.), they kept ridiculously insisting that primitive Graeco-Roman pebble arithmetic was "superior"; hence, one should reject $-1=10-11$ of Indian *ganita*.

Similarly, it is today asserted that axiomatic real numbers and limits are essential to teach calculus and probability. These were invented because Newton's fluxions were incomprehensible even to Europeans. Further, post-Crusade, the padres claimed that mathematics is about axiomatic proof (which prohibits the empirical), as used in Christian rational theology of Aquinas and the schoolmen. However, (1) axiomatic proof is NOT found in the "Euclid" book as eventually admitted in the 20th c. by Hilbert, Russell, and Birkhoff, who rewrote and changed the book to provide the axiomatic proofs missing in it, and made axiomatic proof the foundation of higher math; (2) Axiomatic proof adds no epistemic value; it is MORE fallible than the scientific proof used in Indian *ganita*; and (3) It adds no practical value, but adds *political* value (only for the West).

It is possible to avoid limits by using hyper-real numbers of non-standard analysis. However, it is much better to teach calculus as this author has been doing, using (a) the original Indian numerical methods of Aryabhata, combined with (b) the non-Archimedean polynomial arithmetic of Brahmagupta and Bhaskara, and (c) the related philosophy of zeroism. This (1) makes calculus very easy, (2) enables students to solve harder problems omitted from usual calculus courses, and (3) enables the solution of hitherto long-standing unsolved problems of mathematical physics.

Keywords: Calculus as *ganita*, European failure to understand *ganita*, non-Archimedean polynomial arithmetic, Aryabhata's finite difference method, Brahmagupta's polynomials, negative numbers.

i Article written as part of the book project "Ganita vs Mathematics" for a Tagore Fellowship. Currently, Visiting Professor, IIT Mandi, and Honorary Professor, Indian Institute of Education.