

# One day workshop on alternative mathematics (Rajju ganit and Calculus without limits)

C. K. Raju

**Abstract:** The aim of this workshop is to explain how to do easier math (hence solve harder problems) at both school level (geometry) and early undergraduate level (calculus). It will also briefly indicate how to do better science with it.

Current math teaching derives from colonial education, and came during British rule. However, medieval Europe was arithmetically backward even as regards fractions (there is no systematic notation for fractions in Greek and Roman numerals). Europe imported most of its basic mathematics from India either via Arabs (arithmetic,<sup>1</sup> algebra,<sup>2</sup> trigonometry<sup>3</sup>) or directly from Cochin after the arrival of Jesuits (calculus,<sup>4</sup> probability and statistics<sup>5</sup>).

Long before this, Europe imported a different tradition of *religious* or mystery geometry from Egypt, via Pythagoreans, Plato, and “Neoplatonists” (sufis).<sup>6</sup> On these religious beliefs mathematics involves *eternal truths* (since it arouses the eternal soul), and is hence *exact*. Though this geometry (and the related Platonic notion of soul) was banned by the church in the 6<sup>th</sup> c., it was accepted back in the 12<sup>th</sup> c. for compelling political reasons. At that time of the Crusades against Muslims, Europe was militarily weak, so the church searched for ways to convert Muslims by persuasion. Hence, the church changed its theology to the theology of reason, adapted from the Islamic aql-i-kalam. It adopted the book *Elements* as a text to teach (metaphysical) reasoning to its priests, concocted a theologically correct author “Euclid” for it, and misinterpreted the book.

The two streams, practical mathematics (imported from India) and religious mathematics (imported from Egypt) collided, when Europe imported the Indian calculus and its infinite series. While the practical use of infinite series (for accurate trigonometric values needed for navigation) was quickly understood, there was no way to *physically* sum an infinite series *exactly*. To maintain the superstitious belief that math is exact, in the church tradition of authoritative metaphysics, a huge amount of metaphysics from Newton’s fluxions to “limits”, to unreal “real” numbers, Cantor’s set theory, and formal set theory was invented by Europeans over the next three centuries, to exactly sum infinite series in a non-physical or metaphysical way. No one noticed that the resulting

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- 1 From Al Khwarizmi’s *Hisab al Hind*, called “Arabic numerals” by Gerbert (10<sup>th</sup> c.) who imported them from Cordoba, and algorismus (al Khwarizmi’s Latinised name, in contrast to Roman abacus) by Florentine merchants such as Fibonacci (12<sup>th</sup> c.) who imported them from Africa. Finally, it was called “practical mathematics” by Clavius (16<sup>th</sup> c.) who imported them direct from Cochin, and introduced them in the Jesuit mathematical syllabus.
  - 2 “Algebra” from al Khwarizmi’s “Al jabr waal muqabala” which gave an exposition of Brahmagupta’s avyakt ganit.
  - 3 From the Toledo mass translations of Arabic texts to Latin, 12<sup>th</sup> c., as clear from the very terms such as “sine” (mistranslation of Indian jiva, from Arabic jiba, misread as jaib, meaning pocket or fold (=sinus)).
  - 4 C. K. Raju, *Cultural Foundations of Mathematics: the nature of mathematical proof and the transmission of the calculus from India to Euorope in the 16<sup>th</sup> c. CE*, Pearson Longman, 2007. Or see the easily accessible articles in the *Encyclopedia of Non-Western Science, Technology and Medicine*, Springer, Dordrecht, 2016, on Calculus, pp. 1010–1015. <http://ckraju.net/papers/Springer/ckr-Springer-encyclopedia-calculus-1-final.pdf>, and article on “Calculus transmission”, pp. 1016–1022. <http://ckraju.net/papers/Springer/ckr-Springer-encyclopedia-calculus-2-final.pdf>.
  - 5 C. K. Raju, “Probability in Ancient India”, *Handbook of the Philosophy of Science*, vol 7, *Philosophy of Statistics*, ed. Prasanta S. Bandyopadhyay and Malcolm R. Forster. General Editors: Dov M. Gabbay, Paul Thagard and John Woods. Elsevier, 2011, pp. 1175–1196. <http://ckraju.net/papers/Probability-in-Ancient-India.pdf>. Also, the simplified article in *Encyclopedia of Non-Western Science, Technology and Medicine*, Springer, Dordrecht, 2016, on “Probability”, pp. 3585–3589. <http://ckraju.net/papers/Springer/Probability-springer.pdf>.
  - 6 C. K. Raju, *Euclid and Jesus: How and why the church changed mathematics and Christianity across two religious wars*, Multiversity, Penang, 2012,

metaphysics of infinity is closely allied to the particular notions of eternity<sup>7</sup> which the church regarded as politically correct and incorporated into its core theology.

Needless to say, all this metaphysics adds zilch to the practical value of the calculus for science and engineering, etc. (Of course, the authoritative metaphysics of formal math is *politically* useful to the West: for example, valid mathematics can only be decided by consulting a [Western-approved] mathematical authority, and various biased assumptions can be slipped into science or economics through mathematics.)

People wrongly believe that mathematics is universal. But during colonialism, colonial education Western mathematics displaced indigenous mathematics. Colonial education came as church education even at the university level. It brought a metaphysically loaded mathematics wrapped with a false history (“Euclid”, “Newton and Leibniz invented calculus”) and gave it back to us and declared it to be superior. To our great discredit, even 71 years after independence, we never once critically examined whether that change towards churchified mathematics was better or worse.

We are still not able to discuss it today. Any attempt to critically re-examine the foolish and superstitious church dogmas about infinity in mathematics is regarded as a great crime and absolutely taboo, for taboos are the well known church way of preserving any foolish superstition. For example, any attempt to carry out such a critical examination today is censored,<sup>8</sup> across the world. Formal mathematicians who claim to be authoritative spokespersons run away when asked to defend (in a recorded public debate) the math syllabus that they teach even at the school level: for example the silly metaphysics of invisible geometric points in our NCERT class VI text. That inability to debate publicly is proof that formal mathematicians know they are wrong. Of course, such debate avoidance should not be tolerated, for while formal mathematicians may fear they will lose their jobs, they exhibit criminal lack of concern about the loss to millions of students.

Therefore, it is important that students, and other stakeholders such as parents, physicists, engineers, economists, social scientists etc. assert themselves against the teaching of useless formal mathematics. Eliminating the junk metaphysics of formal math makes math easy (hence enables students to solve harder problems) and makes science better.<sup>9</sup> It preserves all the *practical* value of math though it destroys the *political* power of metaphysical math. That this makes math easy has been demonstrated by teaching geometry in the traditional way, and teaching calculus without limits (details attached). The workshop will go into the details of these, for students have a right to know what their math texts and teachers hide from them.

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7 C. K. Raju, “Eternity and Infinity: the Western misunderstanding of Indian mathematics and its consequences for science today.” *American Philosophical Association Newsletter on Asian and Asian American Philosophers and Philosophies* 14(2) (2015) pp. 27–33. <http://ckraju.net/papers/Eternity-and-infinity-Pages-from-APA.pdf>.

8 For example, C. K. Raju, “To decolonise math stand up to its false history and bad philosophy”. The article was published in the *Conversation*, went viral and was then censored around the world. In India, only *The Wire* put it back after taking it down: <https://thewire.in/75896/to-decolonise-maths-stand-up-to-its-false-history>. It was later published as part of a refereed journal article: C. K. Raju, “Black Thoughts Matter: Decolonized Math, Academic Censorship, and the “Pythagorean” Proposition”, *Journal of Black Studies*, 48(3) pp. 256-278. Most recently it was re-published in Rhodes Must Fall Movement, Oxford, *Rhodes Must Fall: The Struggle to Decolonise the Racist Heart of Empire*, Zed Books London, and University of Chicago Press, 2018, chp, 26. A detailed account is in “Mathematics and censorship”, <https://kafila.online/2017/06/25/mathematics-and-censorship-c-k-raju/>.

9 In support of the claim, “easier math, better science” see, for example, C. K. Raju, “Decolonising math: why it makes science better (and enables students to solve harder problems),” abstract of censored keynote addresses at the 6<sup>th</sup> Palestinian Conference on Modern Trends in Mathematics and Physics, PCMTMP-VI, Palestine Technical University, 5-8 Aug 2018, <http://ckraju.net/papers/palestine-extended-summary.pdf>.

## Earlier courses and workshops



CUTCs, Sarnath



CISSC, Tehran



Ambedkar Univ. Delhi



SGT University, Delhi NCR



Nasik



Gundulupete

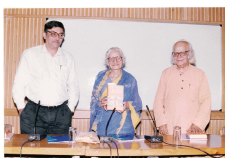
## About C. K. Raju

Professor C. K. Raju holds a PhD from the Indian Statistical Institute, Kolkata, preceded by an MSc in math from Mumbai. He played a key role in building India's first parallel supercomputer, the C-DAC Param.

He has long been a Professor of mathematics and computer science in various universities in India and abroad. An internationally renowned scholar, he has lectured on six continents (Google to see videos of his recent lectures in [Durban](#), [Cape Town](#), [Berlin](#), [Amsterdam](#), [Pretoria](#), [MIT](#), [Lima](#), [Indian Institute of Science](#), [Tehran](#), [Universiti Sains Malaysia](#) etc.)

**He has put forward several revolutionary ideas in his critically acclaimed [books and articles](#).**

In his book [Time: Towards a Consistent Theory](#) (Kluwer/Springer, 1994), he corrected Einstein's mathematical mistake, for which he later [received the TGA Award in Hungary, in 2010](#). His forthcoming sequel on [Functional Differential Equations](#) explains how to use them to correct also Newtonian gravitation. In [Cultural Foundations of Mathematics](#) (Pearson Longman, 2007), he amassed evidence that calculus originated in India, in the 5<sup>th</sup> c., and was stolen by Cochin-based Jesuits in the 16<sup>th</sup> c., and later falsely attributed to Newton and Leibniz. In [The Eleven Pictures of Time](#) (Sage, 2003) he related science to religion across the interface of time. In [Euclid and Jesus](#) (Multiversity, 2012) he explained the religious roots of Western (formal) mathematics.



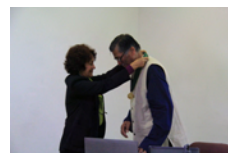
Kapila Vatsyayan, MP and Yash Pal ex-chair, UGC, releasing "Eleven Pictures of Time"



With Dr APJ Abdul Kalam "Is Science Western in Origin?"



TGA Award, Hungary



Fellowship, Institute of Complex Thought, Lima



With the Dalai Lama, explaining difficulties with "Pythagorean theorem"



M. P. Ratna award