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## INDIAN MINDS, ALIEN CALCULATIONS

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Prime Minister Narendra Modi has given the slogan, 'Make in India'. But the minds of the country's citizens are still being made in the West. Our education system apes the Western one designed by the church to produce missionaries. We never critically examined options, even in mathematics.

Mathematics is usually translated into Hindi as *ganit*, but the two are not equivalent. To understand the difference, let us ask: "Why is two plus two, four? People will typically point out that two apples and two apples make four apples. However, that is an empirical proof, ie, one which involves our sense organs (in this case sight). Such empirical proofs are accepted in *ganit*, but prohibited in mathematics. The present-day philosophy of mathematics, established by Bertrand Russell, David Hilbert and others, is broadly called 'formalism'. Formalism stipulates that a mathematical proof must not refer to anything empirical (which we can see, touch etc). It stipulates that we must deduce two plus equals four solely from some postulates such as Peano's axioms or the axioms of set theory.

What difference does that make? First, people know *ganit*, but most are mathematically illiterate, for they don't know Peano's axioms. Even some IIT professors of mathematics are unable to state the axioms of set theory. This has deep political ramifications. It means Indians cannot decide of their own knowledge what their children learn. Even for ' $2+2=4$ ', they are forced to depend on experts whose skills they surmise through Western endorsements. Church education aimed to cultivate faith, which it did by teaching such abject dependence on official authority.

Second, unlike *ganit*, mathematics is not even secular. All Indian belief systems (Hinduism, Buddhism, Jainism), without exception, accept the empirical (*pratyaksa*) as the first means of proof, as do science and Islam. Teaching that empirical proofs are inferior also implicitly means that all these religions (and science) are inferior to math. It is unacceptable to teach this dogma, even implicitly, to millions of children as part of a compulsory subject in our schools. Unfortunately, mass mathematical illiteracy, resulting from Western education, makes it difficult for even Supreme Court judges to pass an informed judgement, based on this unconstitutional practice.

So what is the 'superior' method of proof proposed by formal mathematicians? Since empirical proofs are rejected, this method obviously involves pure metaphysics. Such metaphysics is laced with church dogma. This seems astonishing at first sight, but is quite natural since church metaphysics dominated Western thought for centuries. During the 12th century Crusades, the church declared reason to be universal: it copied and adapted from the Islamic theology of reason the better to convert Muslims. Formalism is based on blind belief in this church dogma that logic is two-valued. That dogma is a standing insult to Buddhists and Jains who use different logics (*catuskoti*, *syadavada*).

The church claimed ownership of reason through false history like that of Euclid. My prize of two lakh rupees for serious evidence about Euclid has gone abegging for years. Further, the *Elements*, attributed to Euclid, used empirical proofs from its first proposition to the last ('Pythagorean' theorem), until Russell and Hilbert 'corrected' it in the 20th century, to use 'superior' methods of proof. They are superior only on church dogma. Formal mathematicians have avoided public debate on this purported

superiority for two decades.

The word ‘mathematics’ derives from ‘mathesis’, which means learning by arousing the soul to make it remember its past lives. In Plato’s Meno, Socrates demonstrates this connection of mathematics to the soul. He elicits the innate mathematical knowledge of a slave boy, and then claims he has proved the existence of the soul. Proclus explained that Socrates used mathematics just because it contains eternal truths which arouse the eternal soul (through the sympathetic magic that ‘like arouses like’).

The belief that math contains eternal truths persisted in the post-Crusade church dogma. Aquinas said that god ruled the world with eternal laws of nature, and it came to be believed that those eternal laws were written in the language of mathematics because it contained eternal truths. Westerners believed mathematics must be perfect, and cannot tolerate the minutest error (which would show up sometime during eternity).

In sharp contrast, ganit is practical knowledge with no pretensions to eternal truth or perfection. Even the earliest sulba sutras explicitly accept that ganit is imperfect (savisesa) and non-eternal (anitya). This contrast between practical ganit and religious mathematics confused Europeans when they imported Indian ganit for its practical value. For, ironically, most school math today (arithmetic, algebra, trigonometry, calculus, probability) is Indian ganit, which went to Europe, where it was misunderstood as math. That misunderstanding was just declared ‘superior’ and returned back during colonialism. Colonised Indians never critically examined that claim of superiority.

Everyday words tell the story of European confusion about mathematics. When efficient Indian arithmetic first reached Christian Europe from Cordoba, in the 10th century, Pope Sylvester II failed to understand it. Amusingly, he thought there was some magic in the shape of the numerals, hence the name Arabic ‘numerals’! The word ‘zero’ from the Arabic sifr (=cypher=mysterious code) shows the European puzzlement. Trigonometry arrived through the 12th century. Toledo translations, where the Sanskrit, jya or jiva (=chord), which went over to the Arabic jiba, was misread as jaib (pocket) and mistranslated as sine (=sinus=fold). This involved also a conceptual misunderstanding for jya relates to a circle, so trigonometry primarily concerns the measurement of circles (curved lines) not triangles (straight lines).

The calculus (and probability) went to Europe via Kochi-based Jesuits in the 16th century. But its infinite series (such as that for the number ‘pi’) puzzled Europeans. Amusingly, Descartes declared the ratios of curved and straight lines (ie, pi) to be beyond the human mind! Newton thought infinite sums could be done “perfectly” through metaphysics. That metaphysics of infinity involves church dogmas about eternity. However, calculus is taught in our schools using just those dogmas about infinity. Interestingly, that university calculus fails for applications to advanced physics, where the original ganit still applies.

Rejecting church dogmas makes math secular. It also makes calculus so easy that the contents of a calculus text of 1,300 pages can be taught within five days — as I have demonstrated with eight groups in five universities in three countries.

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