Re: Your new course on history of science

From: ppchak@cse.iitkgp.ac.in

To: ckr@ckraju.net

Cc: director@iitkgp.ernet.in; bapi@hss.iitkgp.ernet.in; panditanu@gmail.com; jeniamukherjee@gmail.com

Date: Friday, May 4, 2018 at 07:59 PM GMT+5:30

Thanks Sir. We will go through your material. We are learning a lot. Regards PPC

==========
Prof. Partha P. Chakrabarti, FNA, FASc, FNAE
Professor, Dept of Computer Science and Engineering &
Director, Indian Institute of Technology, Kharagpur
Kharagpur - 721 302, INDIA
E-mail : ppchak@cse.iitkgp.ernet.in, director@iitkgp.ernet.in
Tel : +91-3222-282002 (Off)
Fax: +91-3222-282000 (Off)
==========

From: "Prof. C. K. Raju" <ckr@ckraju.net>
To: "Ppchak" <ppchak@cse.iitkgp.ernet.in>
Cc: "director" <director@iitkgp.ernet.in>
Sent: Friday, May 4, 2018 3:37:26 PM
Subject: Your new course on history of science

Dear Professor Chakarabarti,

I was delighted to hear that IIT: Kharagpur has introduced a course in the history of science which you have personally designed. I too developed and taught a course in decolonised history and philosophy of science in Malaysia, way back in 2013, and here is a short video interview with the students, conducted by Claude Alvares.

I was also part of the Project of History of Indian Science, Philosophy, and Culture, since its inception in the early 90's. The PHISPC produced over 100 volumes, of which the 50th was my authored volume, on the origin of calculus in India, in relation to agriculture (calendar) and navigation, and its transmission to Europe in relation to navigation and the Gregorian calendar reform. *Cultural*

Foundations of Mathematics: the nature of mathematical proof and the transmission of the calculus from India to Europe in the 16th c. CE (Pearson Longman, 2007).

History is about the future, not the past. So, how is history relevant today? This has always been a key concern with me. Mere pride in the Indian origin of calculus is worth little if we continue to teach calculus the way it was misunderstood in the West, as we do in our universities and IIT's today, which demand the use of formal real numbers and limits. (Long ago, in 1976, I joined the math department of IIT: Delhi, but left in a few months, because no one in the faculty really understood formal math.) Indeed, on that way of doing calculus, what originated in India was *not* the calculus, as some Western historians assert.

For the last decade I have been working on how using the original Indian calculus (1) makes math easy, and (2) makes science better. A quick account is in my MIT talk "Calculus the real story" (abstract and video),

To demonstrate it makes math easy, I have conducted my 5 day course on calculus without limits in 9 universities in 3 countries. A partial report on it (from 2010), based on teaching 4 batches (1 PG math, 1 UG applied math, 1 UG pure math, and 1 UG non-math) in Universiti Sains Malaysia is in

- "Teaching Mathematics with a Different Philosophy. 1: Formal mathematics as biased metaphysics". *Science and Culture* **77** (2011) 275–80. arxiv:1312.2099.
- "Teaching Mathematics with a Different Philosophy. 2: Calculus without limits". *Science and Culture*, **77** (2011) 281–86. arxiv:1312.2100.

Last year, both the calculus without limits course, and the history and philosophy of science course, were adopted as regular half-courses by SGT University, a private university in Delhi NCR. The idea is to combine tradition with current computer technology as an excellent

tool for numerics.

A key advantage of making math easy is that students learn to do harder problems: for example, in my calculus course they learn elliptic integrals excluded in common courses which are restricted to elementary integrals. You will recall that elliptic integrals are needed for even the first science experiment involving the simple pendulum. There are many other examples, such as the brachistochrone with resistance.

As regards making science better, the simplest example is the way the Indian calculus leads to a better theory of gravitation. Thus, as explained in my book *Time: Towards a Consistent Theory* (Kluwer/Springer, 1994) Newtonian physics failed because of Newton's conceptual error: he made time metaphysical in his *Principia*. (This conceptual error resulted from Newton's poor understanding of the imported Indian calculus, using fluxions, as explained in m book *Cultural Foundations of Math*.) Fully correcting that conceptual error requires us to make Newtonian gravitation Lorentz covariant. This retarded gravitation theory results in consequences inexplicable on general relativity, as explained in more detail in this expository paper. These consequences can be easily tested using the NASA flyby anomaly and, more accurately, with a pair of satellites. This is explained in more detail in my forthcoming book *Functional differential equations: a new paradigm in physics*. I hope to perform that experiment soon.

At a more technical level there is, for example, the issue of discontinuities such as shocks and singularities, at which the differential equations of physics fail on the existing understanding of calculus with limits. I had earlier used non-standard analysis applied to Schwartz distributions to resolve this problem, at a time when I taught and researched in Advanced Functional Analysis in Pune University. However, it can be easily resolved by using Brahmagupta's techniques, as I teach today.

What is least understood is that doing calculus with formal real numbers and limits, forces time to be like the real line. **That destroys any scientific basis for the core religious beliefs of Hinduism**, as

I have repeatedly explained, for example, in my book *The Eleven Pictures of Time* (Sage 2003), and subsequently. This way of doing calculus was used for church propaganda (brazenly claiming that Stephen Hawking's singularity theory proves the truth of Judeo-Christian theology), as I have repeatedly explained for the layperson even in newspaper articles and most recently in talks in Berlin (abstract, video) and the University of Cape Town (abstract, video).

However, the fact is that today the colonised Indian mind is terrified of critiquing the West. Appointments and promotions of academics depend heavily upon Western endorsement. Therefore, as I have explained in my video, A tale of two calendars, even in so obvious a case as the calendar, we have chosen to please the Western master, and reject the superior indigenous calendar. Pleasing the Western master is our real dharma.

Therefore, I see little possibility that IITs will dare teach the advantages of doing calculus the way it originally developed in India, and I have no desire to put you in an uncomfortable position by raising such a demand.

So, I wish you all success in your endeavour. Let us be proud of our past but let us not use it today, for that would invite academic conflict with the West: we would have dared to apply our own mind and do something different.

With regards,

Yours sincerely,

C. K. Raju

C. K. Raju, PhD (ISI), TGA Laureate
Honorary Professor, Indian Institute of Education

(G. D. Parikh CEntre, J. P. Naik Bhavan,
Mumbai University Kalina Campus)

web: http://ckraju.net

Book previews
Time: Towards a Consistent Theory
The Eleven Pictures of Time
Cultural Foundations of Mathematics
Euclid and Jesus
Is Science Western in Origin?

Book reviews
Article reviews