Delhi University,
Political Science Department,
15 Sep 2021, 1430

What your school didn't teach you: the dirty politics of knowledge in the "Pythagorean theorem"

C. K. Raju

Indian Institute of Education
G. D. Parikh Centre, J. P. Naik Bhavan
Mumbai University Kalina Campus
Santacruz (E), Mumbai 400 098

In 2015, the then-minister for S&T reportedly stated during the Indian Science Congress that "Algebra, Pythagoras' theorem originated in India"[1], or that "Pythagoras's theorem [was] an Indian discovery".[2] The minister's statement was big news, as can be seen from the size of the headlines. And this statement was hotly contested. For example, Prabir Purkayastha reiterated in Ganashakti (now removed[3]) that while Pythagorean integer triples, and even the statement of the Pythagorean proposition, are found in the Indian sulba-sutra-s, the critical element, a proof for it, was missing.

In short, the general response among the left and liberal intelligentsia was that this was an attempt to impose a false Hindu chauvinistic history. On the received story (a) there was a Pythagoras (b) who gave a proof of the proposition named after him (c) which no one else in the world (Egyptians, Iraqis/Babylonians, Maya, Indians) did, except for Geeks, (d) who gave the proof in some superior way based on reason. Propositions (a) and (b) are implicitly taught to students, for example, on the current class X NCERT school math text[4] which repeats the term "Pythagorean theorem" 32 times. Propositions (c) and (d) are explicitly stated in the class IX NCERT school text, chp. 5.[5]

There are two issues here: (1) history, and (2) philosophy (of mathematics). Mixing history and philosophy confuses most people. Particularly those who imagine that the issue of the "Pythagorean" theorem concerns solely history, and that there is a unique, universal, and uncontested philosophy of mathematics which is no part of the issue. (A particular notion of proof is central to mathematics, as taught even in high school today,[6] and that notion of proof was clearly central also to the 2015 Pythagorean controversy.)

Pythagoras is myth, not history.[7] and there is no evidence he existed, or that he gave any proof of the proposition named after him. Further, there is ample counter evidence: the Pythagoreans (who existed) were *disinterested* in proofs. Their interest in geometry was solely because of the *religious* connection of geometry to the soul, as described by Plato. On his doctrine that "all learning is recollection" of the knowledge acquired by the soul in its previous lives, Plato related mathesis (=learning) to the soul.[8] Indeed, the very word "mathematics" derives from Plato's doctrine of mathesis, because of the superstitious belief that mathematics (being "eternal truth") especially helps to arouse that innate (=eternal) knowledge, a belief demonstrated by Socrates, in Meno, with his slave boy. Indeed, that etymology, that mathematics derives from mathesis, is explicitly asserted

1 https://www.thehindu.com/news/national/algebra-pythagoras-theorem-originated-in-india-vardhan/undefined. He
2 https://timesofindia.indiatimes.com/india/Pythagorass-theorem-actually-an-Indian-discovery-Harsh-Vardhan/articleshow/45746060.cms
3 But still available at the Wayback machine: https://web.archive.org/web/20161102104249/http://ganashakti.com/english/comments/details/156.
4 https://ncert.nic.in/textbook.php?jemh1=0-15.
5 https://ncert.nic.in/textbook.php?iemh1=5-15.
6 https://ncert.nic.in/textbook.php?iemh1=a1-15.
7 C. K. Raju, 'The Pythagorean Controversy', *Frontier Weekly*, 2015, http://www.frontierweekly.com/archive/vol-number/vol/vol-47-2014-15/47-34/47-34-The%20Pythagorean%20Controversy.html.
8 Plato, Meno, trans. Benjamin Jowett, http://classics.mit.edu/Plato/meno.html. (Search for the third occurrence of the term "soul".)

and explained by the 5th c. Proclus.[9] Obviously, Platonic and Pythagorean ideas, derived from earlier Egyptian mystery geometry, but the immediate point here is that this mystery geometry, whatever its origin, involved a very different philosophy of mathematics from that taught today, though the two are often confounded.

As for the Western history of mathematics, it proceeds on the easy technique of "myth jumping"; the "evidence" for the myth of Pythagoras is provided by jumping to another myth – that of Euclid.[10] But there is no evidence for the existence of Euclid either. Long ago, I offered a challenge prize of Rs 2 lakhs for primary evidence of "Euclid",[11] which prize stands unclaimed today. The official and recent stand of the NCERT is that Indian students are obliged to believe this "Euclid" story, because there are plenty of secondary Western sources for it.[12] This is a ridiculous stand of asking Indian students to have blind faith in the West and believe all its propagandist lies.[13]

Again, it is not just lack of evidence: though Euclid is portrayed as a Caucasian stereotype, despite my objections.[14] There is much counter evidence that the book today attributed to "Euclid" was written by a different person (a black woman) who wrote it for different reasons (the same religious reasons associated with mystery geometry),[15] at a different time—during the violent religious war that the church waged against "pagans" between the 4th and 6th c. That war resulted in the physical destruction of every last temple in the Roman empire, just as every last Hindu temple was destroyed in Goa, shortly after the Portuguese takeover (with inside help) in the 16th c.[16]

The origin of axiomatic proofs (proofs which begin with axioms or assumptions,[17] not facts) is attributed to Euclid. However, there is not a single axiomatic proof in the book Elements attributed to Euclid.[18] Briefly, the proof of the "Pythagorean" theorem, the penultimate proposition in the 19th c. Heiberg version of "Euclid",[19] is based on the 4th or side-angle-side proposition, which has only an empirical proof. It was Dedekind who first noticed that even the first proposition too has an empirical proof. Thus, from the first to the last, there is no axiomatic proof,.

But, until the 19th c., ALL Western scholars foolishly believed this silly story that the "Euclid" book did have such axiomatic proofs (and the most respected Western historians like Needham continue to assert the story of axiomatic proofs in the book long after its falsehood was publicly exposed).

---

9 Proclus, *A Commentary on the First Book of Euclid's Elements*, trans. Glenn R. Morrow (Princeton, New Jersey: Princeton University Press, 1970).

10 "Greek history for idiots: Greediots and Pythagoras. 1: No axiomatic proofs in Greek math", http://ckraju.net/blog/?p=187.

11 "Goodbye Euclid!", http://ckraju.net/blog/?p=63. There are links to videos offering this prize during my 2011 talk chaired by the Malaysian deputy minister of education.

12 "NCERT unable to produce evidence for "Euclid", http://ckraju.net/blog/?p=173. "Second grievance against NCERT", http://ckraju.net/blog/?p=175.

13 I use the term "West" as defined in the glossary of my book C. K. Raju, *The Eleven Pictures of Time: The Physics, Philosophy and Politics of Time Beliefs* (Sage, 2003)., or as explained in my 2017 lectures on "Not out of Greece", at the University of South Africa, posted at http://ckraju.net/unisa.

14 E.g., "इतिहास के विचलन", *Jansatta*, 24 Jan 2008, http://ckraju.net/papers/Jansatta-Euclid.jpg,

15 C. K. Raju, *Euclid and Jesus: How and Why the Church Changed Mathematics and Christianity across Two Religious Wars* (Penang: Multiversity and Citizens International, 2012).

16 P. S. S. Pissurlencar, 'Govyache Khristikarana', Shri Santadurga Quatercentenary Celebration Volume, Shaka 1488–1818, published by Durgarao Krishna Borkar, Bombay, 1966, pp. 91–122. This relies on primary Portuguese sources. English summary in B. S. Shastry and V. R. Navelkar, ed., *Bibliography of Dr Pissurlencar Collection*, part I, Goa University Publication Series, No. 3, pp. 67–69.

17 Note that axiom does NOT mean "self-evident truth" (whatever that might mean), but axiom=postulate=assumption. See, e.g., the summary in the appendix to the class IX school text. https://ncert.nic.in/textbook.php?iemh1=a1-15.

18 "Greek history for idiots: Greediots and Pythagoras. 1: No axiomatic proofs in Greek math," http://ckraju.net/blog/?p=187#more-187. is

19 T.L. Heath, *The Thirteen Books of Euclid's Elements* (New York: Dover Publications, 1956).

Cambridge University,[20] for example, in its "reformed" examination regulations (1888), in which the earlier system of blind mugging was dropped, required that the order of propositions in the Elements was to be followed. (This was excessively foolish because if empirical proofs are given, as they are in the textbook commissioned by Cambridge along with these regulations,[21] then the order of propositions is irrelevant: e.g. the "Pythagorean theorem" can be proved in one step, as in the Indian proof,[22] instead of the 47 steps used in "Euclid".)

However, by the end of the 19th century, it was finally admitted that there are no axiomatic proofs in the Elements, and David Hilbert[23] then rewrote the book, to save the "Euclid" myth, and to force the book to fit this (church) philosophy of mathematics, and to provide the axiomatic proofs missing in it. This did great violence to the original. (For example, length measurement is not permitted in Hilbert's geometry, so the "metry" part of geometry was cut off by Hilbert to save the myth!)

Axiomatic, or metaphysical proofs, emerged as a technique of great political importance to the church, during the Crusades. The Crusades were attempts to grab Muslim wealth by converting Muslims by force, the way "pagans" were converted in Europe earlier. But after the military failure of the Crusades, the church pursued also the alternative tactic of conversion by persuasion. To this end, for church arguments to be acceptable to Muslims, the church co-opted and subverted the prevailing Islamic theology of reason (aql-i-kalam) (related to Neoplatonism) and championed by Averroes[24] (Ibn Rushd) in Spain, against al Ghazali.[25] The church changed its whole theology to claim ownership of reason! However, while the church could accommodate reason, it could not at the same time accommodate facts,[26] for facts are contrary to numerous church dogmas, such as virgin birth. Therefore, the church invented the unique method of axiomatic proofs using r*eason without facts* (formal reason), and actually prohibiting facts, as inferior. This (reasoning without facts) is exactly the method of axiomatic proof taught as the central element of mathematics today.[27] It is different from normal reason (reason with facts) as used by all other cultures and in science.

Axiomatic proofs were first invented/used not by any Greeks but by the Crusading theologian Aquinas,[28] while rationally *proving* the absurd proposition that many angels can sit on a pin. But the church needed a book on which to proceed, and "Aristotelian" reasoning from Averroes or al Ghazali did *not* prohibit facts. It was hence during the Crusades that "Euclid's" Elements was brazenly reinterpreted as a book concerning axiomatic (metaphysical) proofs, though it contains none. It was then used as a church text, in church institutions such as Cambridge, with a view to teach metaphysical reasoning to Christian priests, in accord with Christian rational theology. The church naturally preferred an unknown early Greek "Euclid" to the actual "heretical" "Neoplatonic" author of the text Elements, since the Neoplatonic elements in early Christianity had been cursed[29] and purged by the church by the sixth century.

---

20 http://ckraju.net/geometry/cambridge-note.html.

21 H. M. Taylor, *Euclid's Elements of Geometry* (Cambridge: Cambridge University Press, 1893).

22 C. K. Raju, 'Mathematics and Culture"', in *History, Culture and Truth: Essays Presented to D. P. Chattopadhyaya*, ed. Daya Krishna and K.Satchidananda Murthy (New Delhi, 1999), 179–93; C. K. Raju, 'Computers, Mathematics Education, and the Alternative Epistemology of the Calculus in the Yuktibhāṣā', *Philosophy East and West* 51, no. 3 (2001): 325–62, http://ckraju.net/papers/Hawaii.pdf.

23 David Hilbert, *The Foundations of Geometry* (The Open Court Publishing Co., La Salle, 1950).

24 S. Bergh, *Averroes' Tahâfut al-Tahâfut (Incorporating al-Ghazâlî's Tahafut al-Falasifa) Translated with Introduction and Notes*, vol. 2 (London: Luzac, 1969).

25 Al-Ghazâlî, *Tahâfut Al-Falâsifâ*, trans. S.A. Kamali (Lahore: Pakistan Philosophical Congress, 1958).

26 See, e.g., C. K. Raju, 'Science, Reason, Superstition. 3: The Church Connection of Reason', *Frontier Articles on Society & Politics*, 9 June 2020, https://www.frontierweekly.com/views/jun-20/9-6-20-Science%20reason%20and%20superstition-3.html.

27 See, e.g., the definition of a mathematical proof in the NCERT class IX text: https://ncert.nic.in/textbook.php?iemh1=a1-15. Or, see, the definition in L. Mendelson, *Introduction to Mathematical Logic,* van Nostrand Reinhold, New York, 1964.

28 Thomas Aquinas, *Sumnma Theologica, First Part,* Q. 52, article 3, n.d., http://www.newadvent.org/summa/1052.htm#article3.

It is also completely false that proofs did not exist in any other tradition. For example, the Indian Nyaya Sutra at its very beginning, gives a definition of proof.[30] Though Buddhists and Lokayata disagreed on the means of proof, all Indian schools of thought[31] accepted the pratyaksh, or the empirically manifest, as the first means of proof. Except for the Lokayata, who rejected deductive proof as unreliable, all the other schools also accepted inference based on reason as a valid means of proof. This notion of proof, in India, was the same for all branches of knowledge, including mathematics. If this is understood, there are very much proofs of the "Pythagorean" proposition in India, based on both observation and reasoning (i.e., on reason plus facts).[32]

Regrettably, in the interests of propaganda, these Indian proofs are never mentioned in our school texts. While these proofs all make essential use of the empirical (accepted on the Indian requirement of proof), the proofs actually found in the "Euclid" book are no different: only the myth about the book asserts they are different. The empirical is precisely what is prohibited and disallowed, for political reasons, by the church doctrine of axiomatic proof. This dogma was followed in post-Hilbert mathematics. Given that the empirical (or experiment) is the first means of proof in science, if mathematics is done for the sake of science, what epistemic (non-political) advantage is gained by prohibiting the empirical in mathematics?

The usual wild claim is that deduction is infallible, unlike empirical observation. This is balderdash. As I have explained, axiomatic proofs are decidedly more fallible,[33] since the human mind is more easily deceived than the senses. The fallibility of deduction is quite obvious from the large number of math students who flunk because they turn-in defective proofs. Indeed, given a complex task of deduction, almost every human being will almost always make mistakes, and the only way to overcome those possible mistakes is to recheck the proof repeatedly (induction) or rely on the opinion of an authority. In either case, deduction is far *more* fallible than induction. Infallibility of deduction is just a church superstition like the infallibility of the pope.

Anyway, once we accept the simple fact that there are notions of proof other than the church notion of proof, as used in axiomatic mathematics today, the question arises: which of the two notions of proofs is superior? To reiterate, axiomatic proofs are decidedly more fallible.[34] They also result in an inferior kind of knowledge. Thus, even a valid axiomatic proof does NOT result in valid knowledge in the real world. The simplest example of this is the "Pythagorean" theorem itself: it is NOT *exactly* true anywhere in the real world, not on the curved surface of the earth, not in curved space. Also, in axiomatic mathematics, there is no concept of 98.6% true or approximate truth: all we have is a simple binary of true versus false.[35] What is not true is false (in axiomatic math).

What, then, is the value of an axiomatic proof? The political value of "proof for the church is manifest, for the sole interest of the church was in persuading others. Starting the proof from

---

29 Raju, *The Eleven Pictures of Time: The Physics, Philosophy and Politics of Time Beliefs* Chp. 2, 'The curse on "cyclic" time'.

30 http://ckraju.net/papers/presentations/images/Nyaya-Sutra-Gotama-2-proof.pdf.

31 Haribhadra Suri, षटदर्शन समुच्चय, 5th ed. (Bharatiya Jnanapeeth, 2000).

32 C. K. Raju, 'Mathematics and Culture"', in History, Culture and Truth: Essays Presented to D. P. Chattopadhyaya, ed. Daya Krishna and K.Satchidananda Murthy (New Delhi, 1999), 179–93; C. K. Raju, 'Computers, Mathematics Education, and the Alternative Epistemology of the Calculus in the Yuktibhāṣā', Philosophy East and West 51, no. 3 (2001): 325–62, http://ckraju.net/papers/Hawaii.pdf; C. K. Raju, 'Black Thoughts Matter: Decolonized Math, Academic Censorship, and the "Pythagorean" Proposition', Journal of Black Studies 48, no. 3 (2017): 256–78, https://doi.org/10.1177%2F0021934716688311.

33 C. K. Raju, 'Decolonising Mathematics', *AlterNation* 25, no. 2 (2018): 12–43b, https://doi.org/10.29086/2519-5476/2018/v25n2a2.

34 Raju, 'Decolonising Mathematics', cited above.

35 See, e.g., the appendix on proof in the class IX text, https://ncert.nic.in/textbook.php?iemh1=a1-15.

assumptions meant that authority could be substituted for facts. But for the purposes of *science*, such metaphysical proofs are of no value: what is required are the *two* "Pythagorean" *calculations*.[36]

Now, these "Pythagorean" calculations (1) *calculating* the diagonal of a rectangle from the sides, (2) calculating a side from the diagonal and the angle that it makes with one side. involve certain mathematical sophistications, known in ancient India, Egypt, and Iraq, but unknown to the ancient Greeks. We will consider only the first calculation. For example, in the Manava sulba sutra (10.10),[37] the "Pythagorean" proposition is stated (for a rectangle and its diagonal) using square *roots*. Square roots were certainly known to the sulba-sutras,[38] But, square roots were unknown to the early Greeks and Romans, who did not even have an understanding of general fractions.[39] (Note that one needs to set aside stories based on the 19th c. racist fabrication of ancient Greece.[40]) Knowledge of square roots first went to Europe during the 12th c. Toledo translations from Arabic texts, as is clear from the hilariously wrong translation of "bad karna" (meaning "bad diagonal") as "bad ear" (= deaf=surdus), because karna also means ear. This resulted in the current term "surd" for the square root of 2. Unlike proofs, calculations can, of course, be approximate, and the sulba sutra term for the square root of 2 is savisesha, meaning "with something remaining".

To summarise, each one of the propositions of received history, (a), (b), (c), (d) stated in the second paragraph, and taught in our school text is false. The "Pythagorean theorem" is a pure concoction of Christian chauvinist history, concocted without evidence during the religious fanaticism of the Crusades. The related *normative* requirement of proofs based on assumptions (authoritatively laid down in the West) instead of facts, is also a church requirement, imposed through mathematics.[41] There is nothing surprising about this nexus of the church with math, since the church ruled Europe for over a thousand years. Western education, including Western higher education (universities such as Paris,[42] Oxford and Cambridge) was a church monopoly, and remained so when colonial education was first brought to the colonies by the church. (Secular education, only at the primary level, was introduced in Britain only in 1870.[43])

However, the colonised, throughout the world, failed to understand this. Their mistake was that they completely failed to understand and appreciate the role of the church in partnering with the state, in the West. They thought that secular history and the teaching of supposedly secular subjects like mathematics was beyond church superstitions and myths. Their mistake was to trust the West, instead of cross-checking the received history, and examining the received philosophy.

But the left liberal intelligentsia are so deeply colonized, and indoctrinated by hundreds of interconnected common stories/myths, which they mistake for the truth, that they never once even

---

36 Raju, 'Black Thoughts Matter: Decolonized Math, Academic Censorship, and the "Pythagorean" Proposition'; C. K. Raju, '"Euclid" Must Fall: The "Pythagorean" "Theorem" and the Rant of Racist and Civilizational Superiority - Part 2', *Distinguished Lecture, Universities of Tubingen and Pretoria.*, 13 May 2021, http://ckraju.net/papers/Tubingen-Pretoria-part-2.pdf.

37 http://ckraju.net/papers/presentations/images/manava-sulba-sutra-10-10.png.

38 C. K. Raju, *Cultural Foundations of Mathematics: The Nature of Mathematical Proof and the Transmission of Calculus from India to Europe in the 16th c, CE* (Pearson Longman, 2007) chp. 3.

39 E.g., C. K. Raju, 'To Decolonise Math Stand up to Its False History and Bad Philosophy', *Conversation*, 24 October 2016; C. K. Raju, 'To Decolonise Maths, Stand up to Its False History and Bad Philosophy', *The Wire*, 2016, https://thewire.in/history/to-decolonise-maths-stand-up-to-its-false-history; C. K. Raju, 'To Decolonise Math Stand up to Its False History and Bad Philosophy', in *Rhodes Must Fall: The Struggle to Decolonise the Racist Heart of Empire* (London: Zed Books, 2018), 265–70.

40 Martin Bernal, *Black Athena: The Afroasiatic Roots of Classical Civilization.*, vol. 1: The fabrication of ancient Greece (London: Free Association Books, 1987).

41 Note that axiom=postulate=assumption. See, e.g., the summary in the appendix to the class IX school text. https://ncert.nic.in/textbook.php?iemh1=a1-15.

42 trans Dana C. Munro, *Translations and Reprints from the Original Sources of European History, No. 3, The Medieval Student*, vol. II: No. 3 (Philadelphia: University of Pennsylvania Press, 1897).

43 T. Preston, *Elementary Education Act 1870* (London: William Amer, 1870).

mentioned Christian chauvinistic history or philosophy not even in the last 50 years. This is a collective failure. That is, left-liberals have become the unlikely champions of continuing post-colonial mental colonisation and oppression, by spreading church superstitions and church propaganda in school education, in the name of promoting "reason" and science! That they are also completely ignorant of mathematics, even at the level of 1+1=2. was demonstrated by the fact that there were no takers for my recent prize of Rs 10 lakhs in JNU for a formal proof of 1+1=2.[44]

Indeed, the fact is that the church ruled Europe for over a thousand years, falsehoods are the only weapons (or source of power) the church had, so why should these falsehoods not have been applied to the past? False history was a core church tool in the case of both racism[45] and colonialism.[46] After all, Macaulay changed the Indian system of education by appealing to a false history of science, which none of the colonised checked in the last two centuries, and which they have ensured cannot be checked by not allowing the history of science in Indian universities, and considering the cross-checking of Western history of science as a taboo or some sort of intellectual crime. Like the NCERT they believe that we should have blind faith in all the trash history of mathematics and science written by the West.

But a critical approach of cross-checking the Western history of science is needed to free the colonized of the mental fetters of colonialism even 75 years after notional political independence. It is sad that the left-liberal role in this has been only to try and demonstrate the inferiority of Indians (and, indeed, the whole non-Western world) which is exactly what the church and the colonizer wanted to prove with false history such as that of the "Pythagorean" theorem for which there is zero evidence. From a position of complete ignorance of mathematics, they are happy to condemn future generations to a wretched philosophy of math, erected for the benefit of the church.

Incidentally, the correct factual situation is also that (a) algebra was certainly first invented in India, (b) is found in the avyakt ganita (unexpressed arithmetic) of the 7th c. Brahmagupta in his Brahmasphutasiddhant,[47] (c) which was later transmitted to the Bayt-al-Hikma of Baghdad, where al Khwarizmi wrote his Al Jabr waal Muqabala, (d) which was further transmitted to Europe from, which the name "Algebra" is derived.[48] Europeans however did not understand the underlying non-Archimedean arithmetic of polynomials and its use in the calculus, which too originated in India with Aryabhata, and was transmitted to Europe, in the 16th c. by Cochin-based Jesuits, though its practical uses were understood. But this story of algebra and the calculus is a story for another day.

---

44 C. K. Raju, Statistics for Social Science and Humanities: Should We Teach It Using Normal Math or Formal Math?, 2020, https://www.youtube.com/watch?v=A9Og1k-Z5O4.

45 C. K. Raju, '"Euclid" Must Fall: The "Pythagorean" "Theorem" and the Rant of Racist and Civilizational Superiority - Part 1', (Submitted), http://ckraju.net/papers/Tubingen-Pretoria-part-1.pdf; C. K. Raju, '"Euclid" Must Fall', in International Colloquium on Applications of Conversational Thinking, (Tubingen-Pretoria, 2021), http://www.ckraju.net/papers/International-Colloquium-May-13-14-2021-Programme-and-Book-of-Abstracts.pdf.

46 See, e.g. C. K. Raju, *Ending Academic Imperialism: A Beginning* (Penang: Citizens International, 2011). C. K. Raju, 'Education and Counter-Revolution', Frontier Weekly 46), no. 7, Aug 25-31 (2013), https://www.frontierweekly.com/archive/vol-number/vol/vol-46-2013-14/46-7/46-7-Decolonising%20Hard%20Sciences.html. Original at http://ckraju.net/papers/Education-and-counter-revolution.pdf.

47 For a quick expository account of its present-day relevance, see C. K. Raju, Calculus: The Real Story, 2015, https://www.youtube.com/watch?v=IaodCGDjqzs talk at MIT; C. K. Raju, 'Calculus', in Encyclopedia of Non-Western Science, Technology and Medicine (Springer, 2016), 1010–15, http://ckraju.net/papers/Springer/ckr-Springer-encyclopedia-calculus-1-final.pdf; C. K. Raju, 'Decolonising Mathematics', *AlterNation* 25, no. 2 (2018): 12–43b, https://doi.org/10.29086/2519-5476/2018/v25n2a2.

48 C. K. Raju, 'Precolonial Appropriations of Indian Ganita: Epistemic Issues' (International round table on Indology, IIAS, Shimla, 2020), http://ckraju.net/papers/ckr-indology-abstract.pdf.