

Decolonising math and science

C. K. Raju

Centre for Studies in Civilizations, Delhi
Indian Institute of Education, Pune
web:<http://ckraju.net>

Stock question

Introduction

The critique

Colonialism and
the church

The alternative

The
counter-reaction

- ▶ What is there to decolonise in math?

Stock question

- ▶ What is there to decolonise in math?
- ▶ Isn't $1+1=2$?

Introduction

The critique

Colonialism and
the church

The alternative

The
counter-reaction

Stock question

Introduction

The critique

Colonialism and
the church

The alternative

The
counter-reaction

- ▶ What is there to decolonise in math?
- ▶ Isn't $1+1=2$?
- ▶ **See**, one piece of paper plus one piece of paper makes two pieces of paper.

Stock question

Introduction

The critique

Colonialism and
the church

The alternative

The
counter-reaction

- ▶ What is there to decolonise in math?
- ▶ Isn't $1+1=2$?
- ▶ **See**, one piece of paper plus one piece of paper makes two pieces of paper.
- ▶ **I have no problem with this:**

Stock question

- ▶ What is there to decolonise in math?
- ▶ Isn't $1+1=2$?
- ▶ **See**, one piece of paper plus one piece of paper makes two pieces of paper.
- ▶ **I have no problem with this:**
- ▶ This is the sort of pre-colonial math which I seek to restore as decolonial math.

- ▶ So, what is “colonial” math?

- ▶ So, what is “colonial” math?
- ▶ Also called formal math.

- ▶ So, what is “colonial” math?
- ▶ Also called formal math.
- ▶ Created by David Hilbert and Bertrand Russell etc.

- ▶ So, what is “colonial” math?
- ▶ Also called formal math.
- ▶ Created by David Hilbert and Bertrand Russell etc.
- ▶ Russell and Whitehead in their Principia Mathematica needed 378 pages to prove that $1+1=2$.

•56'101. $\vdash: R \in \check{2} \equiv . D'R, (\check{1}'R \in 1$

Dem.

$\vdash . \bullet 55'16 . \bullet 11'11'341 . \supset$

$\vdash: (\exists x, y) . R = x \downarrow y \equiv: (\exists x, y) . D'R = t'x . (\check{1}'R = t'y ;$

[•11'54] $\equiv: (\exists x) . D'R = t'x : (\exists y) . (\check{1}'R = t'y ;$

[•52'1] $\equiv: D'R, (\check{1}'R \in 1$

(1)

$\vdash . (1) . \bullet 56'1 . \supset \vdash . \text{Prop}$

•56'102. $\vdash: \check{2} = \check{D}'\check{1} \cap \check{C}'\check{1}$

Dem.

$\vdash . \bullet 56'101 . \bullet 37'106 . \supset$

$\vdash: R \in \check{2} \equiv . R \in \check{D}'\check{1} . R \in \check{C}'\check{1} .$

[•22'33] $\equiv . R \in \check{D}'\check{1} \cap \check{C}'\check{1} : \supset \vdash . \text{Prop}$

•56'103. $\vdash: R \in \check{2} . \supset . \check{y} \uparrow R$

Dem.

$\vdash . \bullet 56'101 . \supset \vdash: R \in \check{2} . \supset . D'R \in 1 .$

[•52'16] $\supset . \check{y} \uparrow D'R .$

[•33'24] $\supset . \check{y} \uparrow R : \supset \vdash . \text{Prop}$

•56'104. $\vdash: R \in 0 . \equiv . R = \check{\Lambda}$ [(•56'03)]

•56'11. $\vdash: R \in 2 . \equiv . (\exists x, y) . x \neq y . R = x \downarrow y$ [(•20'3 . (•56'02)]

•56'111. $\vdash: R \in 2 . \equiv . D'R, (\check{1}'R \in 1 . D'R \cap (\check{1}'R = \check{\Lambda}$

Dem.

$\vdash . \bullet 51'231 . \bullet 55'16 . \supset$

$\vdash: x \neq y . R = x \downarrow y \equiv . t'x \cap t'y = \check{\Lambda} . D'R = t'x . (\check{1}'R = t'y .$

[•13'193] $\equiv . D'R \cap (\check{1}'R = \check{\Lambda} . D'R = t'x . (\check{1}'R = t'y$ (1)

$\vdash . (1) . \bullet 56'11 . \bullet 11'11'341 . \supset$

$\vdash: . R \in 2 . \equiv: (\exists x, y) . D'R \cap (\check{1}'R = \check{\Lambda} . D'R = t'x . (\check{1}'R = t'y ;$

[•11'45] $\equiv: D'R \cap (\check{1}'R = \check{\Lambda} : (\exists x, y) . D'R = t'x . (\check{1}'R = t'y ;$

[•11'54] $\equiv: D'R \cap (\check{1}'R = \check{\Lambda} : (\exists x) . D'R = t'x : (\exists y) . (\check{1}'R = t'y ;$

[•52'1] $\equiv: D'R \cap (\check{1}'R = \check{\Lambda} . D'R, (\check{1}'R \in 1 : \supset \vdash . \text{Prop}$

•56'112. $\vdash: R \in 2 . \equiv . D'R, (\check{1}'R \in 1 . C'R \in 2$

Dem.

$\vdash . \bullet 56'111 . \bullet 54'43 . \supset$

$\vdash: R \in 2 . \equiv . D'R, (\check{1}'R \in 1 . D'R \cup (\check{1}'R \in 2 .$

[•33'16] $\equiv . D'R, (\check{1}'R \in 1 . C'R \in 2 : \supset \vdash . \text{Prop}$

•56'113. $\vdash: 2_r = \check{2} \cap \check{C}'\check{2}$

Dem.

$\vdash . \bullet 56'112'101 . \supset \vdash: R \in 2_r \equiv . R \in \check{2} . C'R \in 2 .$

[•37'106 . •33'122] $\equiv . R \in \check{2} . R \in \check{C}'\check{2} .$

[•22'33] $\equiv . R \in \check{2} \cap \check{C}'\check{2} : \supset \vdash . \text{Prop}$

- ▶ If $1+1=2$ is as simple as seeing that 1 dog and 1 dog make 2 dogs,

- ▶ If $1+1=2$ is as simple as seeing that 1 dog and 1 dog make 2 dogs,
- ▶ why did Russell and Whitehead need 378 pages to establish it?

- ▶ If $1+1=2$ is as simple as seeing that 1 dog and 1 dog make 2 dogs,
- ▶ why did Russell and Whitehead need 378 pages to establish it?
- ▶ Are you prepared to accept that what Russell and Hilbert did was gibberish and should be thrown in the dustbin?

- ▶ If $1+1=2$ is as simple as seeing that 1 dog and 1 dog make 2 dogs,
- ▶ why did Russell and Whitehead need 378 pages to establish it?
- ▶ Are you prepared to accept that what Russell and Hilbert did was gibberish and should be thrown in the dustbin?
- ▶ Are you prepared to demand that this formal math be thrown out of the university syllabus?

- ▶ If $1+1=2$ is as simple as seeing that 1 dog and 1 dog make 2 dogs,
- ▶ why did Russell and Whitehead need 378 pages to establish it?
- ▶ Are you prepared to accept that what Russell and Hilbert did was gibberish and should be thrown in the dustbin?
- ▶ Are you prepared to demand that this formal math be thrown out of the university syllabus?
- ▶ Do you understand one line or even one word on that page?

- ▶ If $1+1=2$ is as simple as seeing that 1 dog and 1 dog make 2 dogs,
- ▶ why did Russell and Whitehead need 378 pages to establish it?
- ▶ Are you prepared to accept that what Russell and Hilbert did was gibberish and should be thrown in the dustbin?
- ▶ Are you prepared to demand that this formal math be thrown out of the university syllabus?
- ▶ Do you understand one line or even one word on that page?
- ▶ No.

- ▶ This is an example of how colonial education teaches ignorance.

- ▶ This is an example of how colonial education teaches ignorance.
- ▶ Most university students and graduates don't even know why $1+1=2$.

- ▶ This is an example of how colonial education teaches ignorance.
- ▶ Most university students and graduates don't even know why $1+1=2$.
- ▶ It is also an example of how colonial education instills superstitions.

- ▶ This is an example of how colonial education teaches ignorance.
- ▶ Most university students and graduates don't even know why $1+1=2$.
- ▶ It is also an example of how colonial education instills superstitions.
- ▶ The colonially educated believe that math is universal.

- ▶ This is an example of how colonial education teaches ignorance.
- ▶ Most university students and graduates don't even know why $1+1=2$.
- ▶ It is also an example of how colonial education instills superstitions.
- ▶ The colonially educated believe that math is universal.
- ▶ They don't apply commonsense: if math is universal, why not continue to do it the way the Egyptians did in the Rhind papyrus?

- ▶ This is an example of how colonial education teaches ignorance.
- ▶ Most university students and graduates don't even know why $1+1=2$.
- ▶ It is also an example of how colonial education instills superstitions.
- ▶ The colonially educated believe that math is universal.
- ▶ They don't apply commonsense: if math is universal, why not continue to do it the way the Egyptians did in the Rhind papyrus?
- ▶ Or Indians did in the *śulba sūtra*?

- ▶ The colonially educated don't understand that the purported universality of math is a **normative universality**.

- ▶ The colonially educated don't understand that the purported universality of math is a **normative universality**.
- ▶ The Western way of doing math is declared to be **superior**, and something which **ought** to be the universal norm.

- ▶ The colonially educated don't understand that the purported universality of math is a **normative universality**.
- ▶ The Western way of doing math is declared to be **superior**, and something which **ought** to be the universal norm.
- ▶ Precolonial ways of doing math are declared inferior.

- ▶ The colonially educated don't understand that the purported universality of math is a **normative universality**.
- ▶ The Western way of doing math is declared to be **superior**, and something which **ought** to be the universal norm.
- ▶ Precolonial ways of doing math are declared inferior.
- ▶ University math teaching is premised on these beliefs about superiority which were once explicitly stated in racist terms.

- ▶ For example the “classic” history of math by Rouse Ball asserts

- ▶ For example the “classic” history of math by Rouse Ball asserts
- ▶ “The history of mathematics cannot with certainty be traced back to any school or period before that of the . . . Greeks

- ▶ For example the “classic” history of math by Rouse Ball asserts
- ▶ “The history of mathematics cannot with certainty be traced back to any school or period before that of the . . . Greeks
- ▶ “Though all early **races**. . . knew something of numeration yet the rules. . . were neither **deduced** from nor did they form part of any science.”

- ▶ For example the “classic” history of math by Rouse Ball asserts
- ▶ “The history of mathematics cannot with certainty be traced back to any school or period before that of the . . . Greeks
- ▶ “Though all early **rac**es . . . knew something of numeration yet the rules . . . were neither **dedu**ced from nor did they form part of any science.”
- ▶ These racist beliefs are founded on **myths and dogmas of the Crusading church**.

- ▶ Myth: There was a Greek called Euclid

- ▶ Myth: There was a Greek called Euclid
- ▶ Myth: who did math differently: he used the axiomatic method and deductive proofs in his book *Elements*.

- ▶ Myth: There was a Greek called Euclid
- ▶ Myth: who did math differently: he used the axiomatic method and deductive proofs in his book *Elements*.
- ▶ Superstition: Pure deductive proofs based on reasoning are superior to empirical proofs.

- ▶ Myth: There was a Greek called Euclid
- ▶ Myth: who did math differently: he used the axiomatic method and deductive proofs in his book *Elements*.
- ▶ Superstition: Pure deductive proofs based on reasoning are superior to empirical proofs.
- ▶ This superstition related to the Crusading church's dogma of reason (Aquinas and schoolmen).

- ▶ Myth: There was a Greek called Euclid
- ▶ Myth: who did math differently: he used the axiomatic method and deductive proofs in his book *Elements*.
- ▶ Superstition: Pure deductive proofs based on reasoning are superior to empirical proofs.
- ▶ This superstition related to the Crusading church's dogma of reason (Aquinas and schoolmen).
- ▶ Let us dismantle these myths, superstitions and dogmas promoted by the church (contrary to original Christianity).

- ▶ No evidence for the existence of Euclid.

- ▶ No evidence for the existence of Euclid.
- ▶ Plenty of counter-evidence that the book *Elements* was written by

- ▶ No evidence for the existence of Euclid.
- ▶ Plenty of counter-evidence that the book *Elements* was written by
- ▶ another person, in another time for other reasons.

- ▶ No evidence for the existence of Euclid.
- ▶ Plenty of counter-evidence that the book *Elements* was written by
- ▶ another person, in another time for other reasons.
- ▶ My prize of US\$ 3300 for serious evidence about Euclid stands unclaimed for **last seven years**.

- ▶ Claim of pure deductive proofs in the *Elements* total bunkum.

- ▶ Claim of pure deductive proofs in the *Elements* total bunkum.
- ▶ Not a single pure deductive proof in the book from its first proposition to the last.

- ▶ Claim of pure deductive proofs in the *Elements* total bunkum.
- ▶ Not a single pure deductive proof in the book from its first proposition to the last.
- ▶ This fact admitted in the West at the beginning of the 20th c.

- ▶ Claim of pure deductive proofs in the *Elements* total bunkum.
- ▶ Not a single pure deductive proof in the book from its first proposition to the last.
- ▶ This fact admitted in the West at the beginning of the 20th c.
- ▶ (Russell “It is a scandal that Euclid is still being taught in schools in Britain”.)

- ▶ The book was actually written in the 5th c. CE

- ▶ The book was actually written in the 5th c. CE
- ▶ by a black woman

- ▶ The book was actually written in the 5th c. CE
- ▶ by a black woman
- ▶ in support of pagan religious beliefs

- ▶ The book was actually written in the 5th c. CE
- ▶ by a black woman
- ▶ in support of pagan religious beliefs
- ▶ (based on Egyptian mystery geometry)

- ▶ The book was actually written in the 5th c. CE
- ▶ by a black woman
- ▶ in support of pagan religious beliefs
- ▶ (based on Egyptian mystery geometry)
- ▶ and appropriated by the Crusading church through a bad reinterpretation.

Euclid and Jesus



C. K. Raju



Multiversity



Citizens International

EUCLID AND JESUS

How and why the church changed
mathematics and Christianity
across two religious wars

C. K. RAJU

MULTIVERSITY AND CITIZENS INTERNATIONAL

- ▶ Having disposed off the myth, let us also dispose off the superstition.

- ▶ Having disposed off the myth, let us also dispose off the superstition.
- ▶ Science is reliable since tested by experiments (empirical proofs)

- ▶ Having disposed off the myth, let us also dispose off the superstition.
- ▶ Science is reliable since tested by experiments (empirical proofs)
- ▶ Math is the basis of science.

- ▶ Having disposed off the myth, let us also dispose off the superstition.
- ▶ Science is reliable since tested by experiments (empirical proofs)
- ▶ Math is the basis of science.
- ▶ Hence Western superstition that math not based on empirical proofs is “superior” to math which admits empirical proof is **contrary to commonsense**.

- ▶ Pure deductive reasoning, if divorced from empirical is inferior, and leads to invalid knowledge. E.g.

- ▶ Pure deductive reasoning, if divorced from empirical is inferior, and leads to invalid knowledge. E.g.
- ▶ All animals have two horns.

- ▶ Pure deductive reasoning, if divorced from empirical is inferior, and leads to invalid knowledge. E.g.
- ▶ All animals have two horns.
- ▶ A rabbit is an animal.

- ▶ Pure deductive reasoning, if divorced from empirical is inferior, and leads to invalid knowledge. E.g.
- ▶ All animals have two horns.
- ▶ A rabbit is an animal.
- ▶ Conclusion: Therefore, a rabbit has two horns.

- ▶ Pure deductive reasoning, if divorced from empirical is inferior, and leads to invalid knowledge. E.g.
- ▶ All animals have two horns.
- ▶ A rabbit is an animal.
- ▶ Conclusion: Therefore, a rabbit has two horns.
- ▶ Superior knowledge? or invalid knowledge?

- ▶ The postulates of present-day formal math are **pure metaphysics**.

- ▶ The postulates of present-day formal math are **pure metaphysics**.
- ▶ No possibility of testing them empirically.

- ▶ The postulates of present-day formal math are **pure metaphysics**.
- ▶ No possibility of testing them empirically.
- ▶ To claim that mathematics is “superior” knowledge is to claim that

- ▶ The postulates of present-day formal math are **pure metaphysics**.
- ▶ No possibility of testing them empirically.
- ▶ To claim that mathematics is “superior” knowledge is to claim that
- ▶ Western authority (which approved those postulates) is super-reliable: more reliable than facts.

- ▶ Many other arguments why **deduction is more fallible than induction.**

- ▶ Many other arguments why **deduction is more fallible than induction**.
- ▶ An erroneous deductive proof may be mistaken for a valid proof.

- ▶ Many other arguments why **deduction is more fallible than induction**.
- ▶ An erroneous deductive proof may be mistaken for a valid proof.
- ▶ The elementary proofs in the Elements were wrongly declared to be valid proofs

- ▶ Many other arguments why **deduction is more fallible than induction.**
- ▶ An erroneous deductive proof may be mistaken for a valid proof.
- ▶ The elementary proofs in the Elements were wrongly declared to be valid proofs
- ▶ **for 7 centuries by all Western scholars.**

- ▶ Many other arguments why **deduction is more fallible than induction**.
- ▶ An erroneous deductive proof may be mistaken for a valid proof.
- ▶ The elementary proofs in the Elements were wrongly declared to be valid proofs
- ▶ **for 7 centuries by all Western scholars**.
- ▶ Empirical proofs are admittedly fallible, but never so fallible.

- ▶ On church dogma, logic bids God

- ▶ On church dogma, logic bids God
- ▶ so God cannot create an illogical world but can create facts of his choice

- ▶ On church dogma, logic bids God
- ▶ so God cannot create an illogical world but can create facts of his choice
- ▶ (Hence logical proofs are “superior”).

- ▶ On church dogma, logic bids God
- ▶ so God cannot create an illogical world but can create facts of his choice
- ▶ (Hence logical proofs are “superior”).
- ▶ However, contrary to this dogma, **even logic has to be decided empirically**

- ▶ On church dogma, logic bids God
- ▶ so God cannot create an illogical world but can create facts of his choice
- ▶ (Hence logical proofs are “superior”).
- ▶ However, contrary to this dogma, **even logic has to be decided empirically**
- ▶ (and may be only approximately 2-valued e.g. quantum logic).

- ▶ On church dogma, logic bids God
- ▶ so God cannot create an illogical world but can create facts of his choice
- ▶ (Hence logical proofs are “superior”).
- ▶ However, contrary to this dogma, **even logic has to be decided empirically**
- ▶ (and may be only approximately 2-valued e.g. quantum logic).
- ▶ 2-valued logic not culturally universal either.

- ▶ Church dogmas also creep into science.

- ▶ Church dogmas also creep into science.
- ▶ For example, Aquinas said God rules the world with eternal laws of nature.

- ▶ Church dogmas also creep into science.
- ▶ For example, Aquinas said God rules the world with eternal laws of nature.
- ▶ How to we know there are any eternal laws of nature?

- ▶ Church dogmas also creep into science.
- ▶ For example, Aquinas said God rules the world with eternal laws of nature.
- ▶ How to we know there are any eternal laws of nature?
- ▶ Because Aquinas knew God personally?

- ▶ Belief in “**laws** of nature” (as distinct from observed **regularities**) rejected by other cultures

- ▶ Belief in “**laws** of nature” (as distinct from observed **regularities**) rejected by other cultures
- ▶ e.g. Islam accepts only habits, and accidents (ittefaq)

- ▶ Belief in “**laws** of nature” (as distinct from observed **regularities**) rejected by other cultures
- ▶ e.g. Islam accepts only habits, and accidents (ittefaq)
- ▶ Hinduism has rta

- ▶ Belief in “**laws** of nature” (as distinct from observed **regularities**) rejected by other cultures
- ▶ e.g. Islam accepts only habits, and accidents (ittefaq)
- ▶ Hinduism has rta
- ▶ Buddhism has paticca samuppada

- ▶ Belief in “**laws** of nature” (as distinct from observed **regularities**) rejected by other cultures
- ▶ e.g. Islam accepts only habits, and accidents (ittefaq)
- ▶ Hinduism has rta
- ▶ Buddhism has paticca samuppada
- ▶ However, Newton’s “laws” taught as first serious lesson in science.

- ▶ Church dogma also creeps into science through Western math.

- ▶ Church dogma also creeps into science through Western math.
- ▶ For example, all “laws of physics” formulated as differential equations.

- ▶ Church dogma also creeps into science through Western math.
- ▶ For example, all “laws of physics” formulated as differential equations.
- ▶ On the formalist misunderstanding of calculus

- ▶ Church dogma also creeps into science through Western math.
- ▶ For example, all “laws of physics” formulated as differential equations.
- ▶ On the formalist misunderstanding of calculus
- ▶ to write down the time derivative, we must suppose that time is like a line.

- ▶ Church dogma also creeps into science through Western math.
- ▶ For example, all “laws of physics” formulated as differential equations.
- ▶ On the formalist misunderstanding of calculus
- ▶ to write down the time derivative, we must suppose that time is like a line.
- ▶ Quasi-cyclic time very much part of early Christianity (Origen)

- ▶ Church dogma also creeps into science through Western math.
- ▶ For example, all “laws of physics” formulated as differential equations.
- ▶ On the formalist misunderstanding of calculus
- ▶ to write down the time derivative, we must suppose that time is like a line.
- ▶ Quasi-cyclic time very much part of early Christianity (Origen)
- ▶ but politically motivated curse on “cyclic” time a key aspect of post-Nicene church dogma.

The Eleven Pictures of Time

*The Physics, Philosophy, and
Politics of Time Beliefs*



C. K. Raju

- ▶ Colonialism = con-all-ism.

- ▶ Colonialism = con-all-ism.
- ▶ Colonialism in India established by trickery

- ▶ Colonialism = con-all-ism.
- ▶ Colonialism in India established by trickery
- ▶ not military or technological superiority.

- ▶ Colonialism = con-all-ism.
- ▶ Colonialism in India established by trickery
- ▶ not military or technological superiority.
- ▶ In this process, the church was a key ally of the colonial state.

- ▶ Vasco da Gama reached India in 1498 with the help of an Indian navigator.

- ▶ Vasco da Gama reached India in 1498 with the help of an Indian navigator.
- ▶ In 1582 they tried to “conquer” India by doing a Constantine: they tried (and failed) to convert Moghul emperor Akbar to Christianity.

- ▶ Vasco da Gama reached India in 1498 with the help of an Indian navigator.
- ▶ In 1582 they tried to “conquer” India by doing a Constantine: they tried (and failed) to convert Moghul emperor Akbar to Christianity.
- ▶ First military victory by British came only 250 years later in 1758: won by bribing the opposing army!

- ▶ British were easily overthrown by the revolt of 1857.

- ▶ British were easily overthrown by the revolt of 1857.
- ▶ But then introduced a new weapon: the University.

- ▶ British were easily overthrown by the revolt of 1857.
- ▶ But then introduced a new weapon: the University.
- ▶ This stabilised colonial power by inculcating loyalty among the colonised.

- ▶ British were easily overthrown by the revolt of 1857.
- ▶ But then introduced a new weapon: the University.
- ▶ This stabilised colonial power by inculcating loyalty among the colonised.
- ▶ The university was a church institution: Western higher education a church monopoly for centuries.

- ▶ Macaulay said (in 1847 against Marx) church education is the best means of curbing revolt.

- ▶ Macaulay said (in 1847 against Marx) church education is the best means of curbing revolt.
- ▶ Church education was designed to create missionaries, fanatically loyal to the church

- ▶ Macaulay said (in 1847 against Marx) church education is the best means of curbing revolt.
- ▶ Church education was designed to create missionaries, fanatically loyal to the church
- ▶ Colonial education created the colonial mind: fanatically loyal to the West.

- ▶ Therefore, de-colonisation = de-theologisation

- ▶ Therefore, de-colonisation = de-theologisation
- ▶ (of math and science).

- ▶ Therefore, de-colonisation = de-theologisation
- ▶ (of math and science).
- ▶ Instead of using math and science to spread church dogmas.

- ▶ Therefore, de-colonisation = de-theologisation
- ▶ (of math and science).
- ▶ Instead of using math and science to spread church dogmas.
- ▶ Eliminate church dogmas and superstitions from math and science

- ▶ Therefore, de-colonisation = de-theologisation
- ▶ (of math and science).
- ▶ Instead of using math and science to spread church dogmas.
- ▶ Eliminate church dogmas and superstitions from math and science
- ▶ and church myths from the history and philosophy of science.

- ▶ This has been done in the case of the calculus.

- ▶ This has been done in the case of the calculus.
- ▶ Calculus originated in India (5th c.)

- ▶ This has been done in the case of the calculus.
- ▶ Calculus originated in India (5th c.)
- ▶ developed over a thousand year period

- ▶ This has been done in the case of the calculus.
- ▶ Calculus originated in India (5th c.)
- ▶ developed over a thousand year period
- ▶ and was transmitted to Europe in the 16th c.

- ▶ This has been done in the case of the calculus.
- ▶ Calculus originated in India (5th c.)
- ▶ developed over a thousand year period
- ▶ and was transmitted to Europe in the 16th c.
- ▶ by Jesuits based in Cochin who mass translated Indian texts

- ▶ This has been done in the case of the calculus.
- ▶ Calculus originated in India (5th c.)
- ▶ developed over a thousand year period
- ▶ and was transmitted to Europe in the 16th c.
- ▶ by Jesuits based in Cochin who mass translated Indian texts
- ▶ as in Toledo mass translations from Arabic in 12th c.

- ▶ Infinite series of calculus were used in India to derive precise trigonometric values

- ▶ Infinite series of calculus were used in India to derive precise trigonometric values
- ▶ precise to about ten decimal places.

- ▶ Infinite series of calculus were used in India to derive precise trigonometric values
- ▶ precise to about ten decimal places.
- ▶ These were needed for European navigational problems of loxodromes, latitude, and longitude.

- ▶ Europeans understood the practical value of infinite series, but not how to sum it.

- ▶ Europeans understood the practical value of infinite series, but not how to sum it.
- ▶ They added on tons of useless metaphysics (set theory, formal real numbers etc.)

- ▶ Europeans understood the practical value of infinite series, but not how to sum it.
- ▶ They added on tons of useless metaphysics (set theory, formal real numbers etc.)
- ▶ Eliminating that metaphysics makes calculus very easy (fat calculus text can be taught in 5 days)

- ▶ Europeans understood the practical value of infinite series, but not how to sum it.
- ▶ They added on tons of useless metaphysics (set theory, formal real numbers etc.)
- ▶ Eliminating that metaphysics makes calculus very easy (fat calculus text can be taught in 5 days)
- ▶ as demonstrated in teaching experiments with 8 groups in 5 universities in 3 countries.

Central University of Tibetan Studies
Sarag, Nepal
Workshop on "Calculus without Limits"
22nd - 28th September, 2009
By Prof. David Hestenes, USTC





نشست علمی "ریاضیات از منظری دیگر"، پروفیسور سی.کی. راجو
مرکز مطالعات و همکاری‌های علمی بین‌المللی، تهران، ۱۳۹۱



- ▶ Usual doubt: “it works”

- ▶ Usual doubt: “it works”
- ▶ Answer: decolonised calculus **works better**.

- ▶ Usual doubt: “it works”
- ▶ Answer: decolonised calculus **works better**.
- ▶ Leads to a better science (e.g corrected theory of gravitation).

- ▶ Usual doubt: “it works”
- ▶ Answer: decolonised calculus **works better**.
- ▶ Leads to a better science (e.g corrected theory of gravitation).
- ▶ See, further, video and abstract of my MIT talk

- ▶ Usual doubt: “it works”
- ▶ Answer: decolonised calculus **works better**.
- ▶ Leads to a better science (e.g corrected theory of gravitation).
- ▶ See, further, video and abstract of my MIT talk
- ▶ and exposition of philosophy of zeroism in Springer encyclopedia.

- ▶ The value of myths should not be underestimated.

- ▶ The value of myths should not be underestimated.
- ▶ Macaulay imposed colonial education by appealing to a false history of science.

- ▶ The value of myths should not be underestimated.
- ▶ Macaulay imposed colonial education by appealing to a false history of science.
- ▶ Hence, I suggested that a decolonised course on history and philosophy of science should be taught.

- ▶ The value of myths should not be underestimated.
- ▶ Macaulay imposed colonial education by appealing to a false history of science.
- ▶ Hence, I suggested that a decolonised course on history and philosophy of science should be taught.
- ▶ In my booklet *Ending Academic Imperialism*.

C K Raju

ENDING

ACADEMIC
IMPERIALISM

... a beginning



Citizens International

- ▶ This was followed by a curriculum development workshop

- ▶ This was followed by a curriculum development workshop
- ▶ and the course was taught to several batches of students.

Introduction

The critique

Colonialism and
the church

The alternative

The
counter-reaction







- ▶ And here is a short video of the student's reactions to the course.

- ▶ Recent censorship of my article on decolonised math

- ▶ Recent censorship of my article on decolonised math
- ▶ by the South Africa editor of the *Conversation*.