

Decolonizing mathematics

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Introduction

What is decolonization?

Why should math be metaphysics?

Mathesis

The Crusades and math

A third source of bias

What's the alternative?

What the West did

Petition to teach religiously neutral math

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

What is colonization?

- ▶ What is decolonization?

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- ▶ What is decolonization?
- ▶ Why is it needed?

What is colonization?

- ▶ What is decolonization?
- ▶ Why is it needed?
- ▶ First, what is colonization?

Colonization conquered the mind

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ Colonization was not mere physical conquest.

Colonization conquered the mind

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- ▶ It conquered the mind of the colonised.

Feeling inferior

- ▶ The colonised believed they they were inferior.

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Feeling inferior

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- ▶ They believed that to become superior they must imitate the West in everything: clothes, speech, music, food.
- ▶ E.g. wearing ties and a suit in Delhi summer.

Feeling inferior

- ▶ The colonised believed they they were inferior.
- ▶ They believed that to become superior they must imitate the West in everything: clothes, speech, music, food.
- ▶ E.g. wearing ties and a suit in Delhi summer.
- ▶ Even mispronouncing their own **names**: Mumbai as Bombay, Dilli as Delhi etc.

Similar to church technique

- ▶ This technique of mind capture very similar to church propaganda for conversion.

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- ▶ Tell people their religion is inferior, Islam is inferior, Hinduism is inferior and the solution for them is to turn Christian because Christianity is superior.

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- ▶ Tell people their religion is inferior, Islam is inferior, Hinduism is inferior and the solution for them is to turn Christian because Christianity is superior.
- ▶ **The difference:** colonial state asked people to turn Western not Christian.

Similar to church technique

- ▶ This technique of mind capture very similar to church propaganda for conversion.
- ▶ Tell people their religion is inferior, Islam is inferior, Hinduism is inferior and the solution for them is to turn Christian because Christianity is superior.
- ▶ **The difference:** colonial state asked people to turn Western not Christian.
- ▶ The aim was make you subordinate to the state not the church.

What superiority?

In the 16th c.

- ▶ In the 16th c. Europeans were very poor. They came to India and China famed for wealth.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

What superiority?

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What superiority?

In the 16th c.

- ▶ In the 16th c. Europeans were very poor. They came to India and China famed for wealth.
- ▶ So desperate for wealth that they were willing to die like flies, and did. $\frac{1}{3}$ rd died on each trip to India.
- ▶ They were crude, ignorant and technologically backward.

An example

The great discoverer

- ▶ E.g. Vasco da Gama had no instrument to determine latitude and longitude at sea.

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

An example

The great discoverer

- ▶ E.g. Vasco da Gama had no instrument to determine latitude and longitude at sea.
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Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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The great discoverer

- ▶ E.g. Vasco da Gama had no instrument to determine latitude and longitude at sea.
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- ▶ The instrument is held between the teeth, and uses the pole star called *kau* (also means teeth).
- ▶ Vasco da Gama wrote that the man “told the distance by his teeth”.

Apply commonsense

Cheating and bribery, not technology

- ▶ Europeans kept dreaming of conquering India from the beginning. Attempted to conquer India by converting Akbar, in 1582.

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ But failed miserably for over 250 years (from 1498 to 1757).

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Their first victory in 1757 was obtained by cheating and bribery, not any superior technology.

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Cheating and bribery, not technology

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- ▶ But failed miserably for over 250 years (from 1498 to 1757).
- ▶ Their first victory in 1757 was obtained by **cheating** and **bribery**, not any superior technology.
- ▶ (Both the money and the people involved were Indian: the cheating was British.)

False history

- ▶ Then suddenly they became “superior” (by 1823).

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- ▶ This involved more cheating: church propaganda based on a false history of science.
- ▶ That false history was used to change the system of education.
- ▶ This was used for indoctrination.

Education and propaganda

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- ▶ It occupied their mind through tricks. E.g. false history which glorified the West and belittled others. (E.g. “Vasco da Gama **discovered** India”).

Education and propaganda

- ▶ Western education (Bologna, Paris, Cambridge, Oxford) started during Crusades against Muslims.
- ▶ It was designed by the church to produce missionaries.
- ▶ It occupied their mind through tricks. E.g. false history which glorified the West and belittled others. (E.g. “Vasco da Gama **discovered** India”).
- ▶ It taught people to distrust all (even themselves and trust only the West).

End of colonisation?

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- ▶ All references in Iranian learned research works are Western. Iranian philosophers know nothing of Indian or Chinese philosophy, only about inferior Western philosophers like Heidegger and Descartes.

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- ▶ All Iranian school texts are Western. So many Iranians go to the West for education.
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- ▶ The political structure continues to be imitative: e.g. the Indian constitution still imitates the West.

Interim summary

What is colonization?

- ▶ Colonization conquered the mind by making people feel inferior and that the West is superior.

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Colonization conquered the mind by making people feel inferior and that the West is superior.
- ▶ This was achieved through false history and by globalising church education.
- ▶ This education systematically inculcated the superstition that the only way to become superior is to imitate the West.

Interim summary

What is colonization?

- ▶ Colonization conquered the mind by making people feel inferior and that the West is superior.
- ▶ This was achieved through false history and by globalising church education.
- ▶ This education systematically inculcated the superstition that the only way to become superior is to imitate the West.
- ▶ If you believe that, your mind is still colonised. (If not, what was the non-imitative thing you did?)

What is decolonization?

- ▶ Decolonisation is **NOT** the formula “reject the West”.
That is a false caricature.

What is decolonization?

- ▶ Decolonisation is **NOT** the formula “reject the West”. That is a false caricature.
- ▶ Decolonisation means **“Be critical, choose what is best”**.

The standard position

What is accepted

- ▶ Everyone accepts decolonisation necessary in human and social sciences. (“If French sociology is different from American, why not an Iranian or Indian sociology.”)

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- ▶ But the belief about hard sciences (mathematics, physics, chemistry) is different.
- ▶ **Science in the service of imperialism.** Many people accept that science and technology has been put to unethical use for war and domination.

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- ▶ Everyone accepts decolonisation necessary in human and social sciences. (“If French sociology is different from American, why not an Iranian or Indian sociology.”)
- ▶ But the belief about hard sciences (mathematics, physics, chemistry) is different.
- ▶ **Science in the service of imperialism.** Many people accept that science and technology has been put to unethical use for war and domination.
- ▶ **Science in the service of profit and capitalism.** Many people agree that science has led to the wrong kind of technological products. E.g. antibiotics, chemical fertilizer, cars.

My position

Hard sciences itself must be changed

- ▶ I agree that all this must be changed.

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

My position

Hard sciences itself must be changed

- ▶ I agree that all this must be changed.
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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

My position

Hard sciences itself must be changed

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- ▶ My position is that the **content** of hard science itself must be changed.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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Hard sciences itself must be changed

- ▶ I agree that all this must be changed.
- ▶ But that still only addresses the science-society interface, not the **content** of science.
- ▶ My position is that the **content** of hard science itself must be changed.
- ▶ Because **science too is ideological**.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Address the content of science

- ▶ Addressing the content of **science** is a **much harder problem**, but we cannot set it aside.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Address the content of science

- ▶ Addressing the content of **science** is a **much harder problem**, but we cannot set it aside.
- ▶ You might feel that nanotechnology and nuclear physics are too far from your lives, so leave them alone.

Address the content of science

- ▶ Addressing the content of **science** is a **much harder problem**, but we cannot set it aside.
- ▶ You might feel that nanotechnology and nuclear physics are too far from your lives, so leave them alone.
- ▶ But you cannot have the benefit of science and technology and ignore the underlying ideology. If you want Western technology, you will also get the ideology.

Neglecting the core of science is disastrous

- ▶ Neglecting the core of science is a **wrong and short-sighted policy**.

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ Neglecting the core of science is a **wrong and short-sighted policy**.
- ▶ It is like catching a snake by the tail, and neglecting its head: the snake will turn around and bite you.

Neglecting the core of science is disastrous

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ Neglecting the core of science is a **wrong and short-sighted policy**.
- ▶ It is like catching a snake by the tail, and neglecting its head: the snake will turn around and bite you.
- ▶ The West understands this weakness, and uses it to attack your beliefs.

Islam and science

A quick example

- ▶ E.g. in articles in *Guardian*, London, and *Chronicle of Higher Education*, science has been used to attack Islam as anti-science.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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A quick example

- ▶ E.g. in articles in *Guardian*, London, and *Chronicle of Higher Education*, science has been used to attack Islam as anti-science.
- ▶ Their claim is that Islam (as distinct from Christianity or some other religion) is **contrary** to science and hence must be rejected.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Islam and science

A quick example

- ▶ E.g. in articles in *Guardian*, London, and *Chronicle of Higher Education*, science has been used to attack Islam as anti-science.
- ▶ Their claim is that Islam (as distinct from Christianity or some other religion) is **contrary** to science and hence must be rejected.
- ▶ Why? Because science requires belief in “laws of nature” and Islam believes in the will of Allah that can intervene in the world at any time.

My position

- ▶ My position is that it is **wrong** to say that science is against Islam.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

My position

- ▶ My position is that it is **wrong** to say that science is against Islam.
- ▶ The correct statement is that **Western** science is against Islam.

My position

- ▶ My position is that it is **wrong** to say that science is against Islam.
- ▶ The correct statement is that **Western** science is against Islam.
- ▶ That is, the science which developed in the West is not universal.

My position

- ▶ My position is that it is **wrong** to say that science is against Islam.
- ▶ The correct statement is that **Western** science is against Islam.
- ▶ That is, the science which developed in the West is not universal.
- ▶ It is ideologically loaded with church metaphysics which is anti-Islam.

Laws of nature

- ▶ Western science believes there are laws of nature. (E.g. Newton's "laws" of motion and "law" of gravitation, which you learnt in school)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ However, this is a **religious** belief **not** a scientific belief.

Laws of nature

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- ▶ However, this is a **religious** belief **not** a scientific belief.
- ▶ It was first stated by Aquinas in *Summa Theologica* that God rules the world with eternal laws of nature.

Laws of nature

- ▶ Western science believes there are laws of nature. (E.g. Newton's "laws" of motion and "law" of gravitation, which you learnt in school)
- ▶ However, this is a **religious** belief **not** a scientific belief.
- ▶ It was first stated by Aquinas in *Summa Theologica* that God rules the world with eternal laws of nature.
- ▶ (He reached this conclusion on political grounds. But that is another story of church politics.)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ So belief in laws of nature is a religious belief (or part of church ideology).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ So belief in laws of nature is a religious belief (or part of church ideology).
- ▶ Belief in eternal laws of nature is not scientific belief (e.g. not refutable according to Popper's criterion).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ So belief in laws of nature is a religious belief (or part of church ideology).
- ▶ Belief in eternal laws of nature is not scientific belief (e.g. not refutable according to Popper's criterion).
- ▶ It is just a superstition taught to you through Western education.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Belief in eternal laws of nature is not scientific belief (e.g. not refutable according to Popper's criterion).
- ▶ It is just a superstition taught to you through Western education.
- ▶ In contrast, al Ghazali said that Allah has habits, which can change, hence no eternal rules.

Mundane observation

- ▶ This is also what we commonly observe: the future is partly decided by **us** (our will) not just by laws.

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- ▶ But Western science prefers ideology to facts.

Mundane observation

- ▶ This is also what we commonly observe: the future is partly decided by **us** (our will) not just by laws.
- ▶ (Hence we punish a criminal.)
- ▶ But Western science prefers ideology to facts.
- ▶ And Indians, Chinese, and Iranians believe Western science is superior and must be imitated.

Interim summary

Decolonization

- ▶ Decolonization means a critical approach: neither blind acceptance nor blind rejection.

Interim summary

Decolonization

- ▶ Decolonization means a critical approach: neither blind acceptance nor blind rejection.
- ▶ Not sufficient to condemn uses of science for war and profit.

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Decolonization means a critical approach: neither blind acceptance nor blind rejection.
- ▶ Not sufficient to condemn uses of science for war and profit.
- ▶ **Cannot accept just the practical value of science and reject its ideology.**

Interim summary

Decolonization

- ▶ Decolonization means a critical approach: neither blind acceptance nor blind rejection.
- ▶ Not sufficient to condemn uses of science for war and profit.
- ▶ **Cannot accept just the practical value of science and reject its ideology.**
- ▶ Must change hard science (mathematics, physics, biology, ...).

Change has already been made

- ▶ This change has already been carried out

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Change has already been made

- ▶ This change has already been carried out
- ▶ I have already proposed a non-ideological science at all scales from sub-atomic to cosmology.

The news physics

At all scales

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Scale	Theory	Rejected metaphysics	New theory
Sub-atomic	Quantum field theory	Metaphysics of infinity (renormalization)	Explained in <i>Cultural Foundations of Mathematics</i> , various papers etc.
Atomic	Quantum mechanics	Metaphysics of causality (wavefunction collapse)	Structured time interpretation of qm explained in <i>Time: Towards a Consistent Theory</i>
Atomic/molecular	Electrodynamics	Metaphysics of infinity (radiation damping)	Reformulation of Maxwell's equations using functional differential equations (FDEs). See paper.
Mesophysics	Bio-molecules, biological organisms.	Metaphysics of mechanism ("laws of nature"). Metaphysics of chance.	Mixed-type FDEs and spontaneity (see <i>Eleven Pictures of Time</i> . Paper on electrodynamic 2-body problem)
Planetary and galactic physics. Cosmology.	Newtonian gravitation/general relativity	Metaphysics of action by contact	Retarded gravitation theory (reformulates gravitation using retarded FDEs, see paper.)

Waiting for certification

(Like waiting for Godot)

- ▶ However, the colonised think “science = Western certification”.

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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(Like waiting for Godot)

- ▶ However, the colonised think “science = Western certification” .
- ▶ They are unwilling to apply their minds, and their education did not teach them enough to do so.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Waiting for certification

(Like waiting for Godot)

- ▶ However, the colonised think “science = Western certification” .
- ▶ They are unwilling to apply their minds, and their education did not teach them enough to do so.
- ▶ So, they are waiting for Western certification of this new science which eliminates Western ideology! (Like asking a clergyman to certify something contrary to his religion.)

Scope of this talk

- ▶ Today, I will restrict myself to explain the ideological content of Western mathematics

Scope of this talk

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- ▶ as taught in our schools and universities.

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- ▶ Since mathematics is the basis of science

Scope of this talk

- ▶ Today, I will restrict myself to explain the ideological content of Western mathematics
- ▶ as taught in our schools and universities.
- ▶ Since mathematics is the basis of science
- ▶ that already explains the ideology in science.

The claim

- ▶ The claim is that Western mathematics is ideologically loaded

The claim

- ▶ The claim is that Western mathematics is ideologically loaded
- ▶ that this ideology is anti-Islam, anti-Hindu, anti-Buddhist, and pro-church.

The claim

- ▶ The claim is that Western mathematics is ideologically loaded
- ▶ that this ideology is anti-Islam, anti-Hindu, anti-Buddhist, and pro-church.
- ▶ So, we should reject it and have a new mathematics.

A natural question

- ▶ So, where is the ideology in $2+2=4$?

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

A natural question

- ▶ So, where is the ideology in $2+2=4$?
- ▶ Will $2+2=4$ change with ideology?

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

A natural question

- ▶ So, where is the ideology in $2+2=4$?
- ▶ Will $2+2=4$ change with ideology?
- ▶ **YES.**

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

A natural question

- ▶ So, where is the ideology in $2+2=4$?
- ▶ Will $2+2=4$ change with ideology?
- ▶ **YES.**
- ▶ How?

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The issue

- ▶ The issue is not **that** $2+2=4$, but **why** $2+2=4$.

The issue

- ▶ The issue is not **that** $2+2=4$, but **why** $2+2=4$.
- ▶ **Why** is $2+2=4$?

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The issue

- ▶ The issue is not **that** $2+2=4$, but **why** $2+2=4$.
- ▶ **Why** is $2+2=4$?
- ▶ (This is not a rhetorical question. Waiting for an answer from you.)

Formal math prohibits empirical proofs

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ No, the answer is not that you **see** $2 \text{ oranges} + 2 \text{ oranges} = 4 \text{ oranges}$.

Formal math prohibits empirical proofs

- ▶ No, the answer is not that you see $2 \text{ oranges} + 2 \text{ oranges} = 4 \text{ oranges}$.
- ▶ What you can see (or touch etc.) is empirical, and empirical proofs are prohibited in present-day mathematics.

A fishy proposition

- ▶ Also, empirically $2+2=4$ is **not** always true.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

A fishy proposition

- ▶ Also, empirically $2+2=4$ is **not** always true.
- ▶ E.g. 2 big fish + 2 small fish = how many fish? 3 big fish or 5 small fish?

A fishy proposition

- ▶ Also, empirically $2+2=4$ is **not** always true.
- ▶ E.g. 2 big fish + 2 small fish = how many fish? 3 big fish or 5 small fish?
- ▶ Practical answer: weigh the fish, so if fish sell for Rs 100 a kilo, then the answer may be 2 big fish + 2 small fish = 5.2 fish.

A fishy proposition

- ▶ Also, empirically $2+2=4$ is **not** always true.
- ▶ E.g. 2 big fish + 2 small fish = how many fish? 3 big fish or 5 small fish?
- ▶ Practical answer: weigh the fish, so if fish sell for Rs 100 a kilo, then the answer may be 2 big fish + 2 small fish = 5.2 fish.
- ▶ If you give this practical truth of the marketplace in school, they will punish you. So, the real proof of $2+2=4$ is by fear of punishment!

Peano's axioms

- ▶ So, once again, **why** is $2+2=4$?

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Peano's axioms

- ▶ So, once again, **why** is $2+2=4$?
- ▶ According to present-day math, the answer lies in Peano's axioms from which $2+2=4$ must be **deduced**

Peano's axioms

- ▶ So, once again, **why** is $2+2=4$?
- ▶ According to present-day math, the answer lies in Peano's axioms from which $2+2=4$ must be **deduced**
- ▶ Why? Because Westerners say so, you are inferior, and your education teaches that you must blindly accept what they say.

Peano's axioms

for Natural numbers

- ▶ 1 is a natural number

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Peano's axioms

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- ▶ if n is a natural number so is n' (called the successor of n)
- ▶ (Axioms for addition)

$$n + 1 = n'$$

$$n + m' = (n + m)'$$

Peano's axioms

for Natural numbers

- ▶ 1 is a natural number
- ▶ if n is a natural number so is n' (called the successor of n)
- ▶ (Axioms for addition)

$$n + 1 = n'$$

$$n + m' = (n + m)'$$

- ▶ (Definitions) $1' = 2, 2' = 3, 3' = 4, \dots$

(Semi-) Formal proof of $2 + 2 = 4$

- ▶ $2 = 1'$ (definition of 2)

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

(Semi-) Formal proof of $2 + 2 = 4$

- ▶ $2 = 1'$ (definition of 2)
- ▶ $2 + 2 = 2 + 1' = (2 + 1)'$ (by axiom for addition)

Outline

Introduction

**What is
decolonization?**

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

(Semi-) Formal proof of $2 + 2 = 4$

- ▶ $2 = 1'$ (definition of 2)
- ▶ $2 + 2 = 2 + 1' = (2 + 1)'$ (by axiom for addition)
- ▶ $2 + 1 = 2'$ (by axiom for addition)

(Semi-) Formal proof of $2 + 2 = 4$

- ▶ $2 = 1'$ (definition of 2)
- ▶ $2 + 2 = 2 + 1' = (2 + 1)'$ (by axiom for addition)
- ▶ $2 + 1 = 2'$ (by axiom for addition)
- ▶ $2' = 3$ (by definition of 3)

(Semi-) Formal proof of $2 + 2 = 4$

- ▶ $2 = 1'$ (definition of 2)
- ▶ $2 + 2 = 2 + 1' = (2 + 1)'$ (by axiom for addition)
- ▶ $2 + 1 = 2'$ (by axiom for addition)
- ▶ $2' = 3$ (by definition of 3)
- ▶ Hence, $(2 + 1)' = 3' = 4$ (by definition of 4).

The religious bias

The first source

- ▶ Note that the rejection of empirical proofs already involves a religious bias.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The religious bias

The first source

- ▶ Note that the rejection of empirical proofs already involves a religious bias.
- ▶ Islam accepts empirical proofs (*tajurba*), as do Hinduism, Buddhism, and all systems of Indian philosophy (*pratyakṣa*), and as does science (experiment).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The religious bias

The first source

- ▶ Note that the rejection of empirical proofs already involves a religious bias.
- ▶ Islam accepts empirical proofs (*tajurba*), as do Hinduism, Buddhism, and all systems of Indian philosophy (*pratyakṣa*), and as does science (experiment).
- ▶ If you accept the current philosophy of math, you accept that empirical proofs are inferior.

The religious bias

The first source

- ▶ Note that the rejection of empirical proofs already involves a religious bias.
- ▶ Islam accepts empirical proofs (*tajurba*), as do Hinduism, Buddhism, and all systems of Indian philosophy (*pratyakṣa*), and as does science (experiment).
- ▶ If you accept the current philosophy of math, you accept that empirical proofs are inferior.
- ▶ That means that you have accepted that Islam, Hinduism, Buddhism are inferior, and that science is inferior to math.

Why do math like this?

- ▶ So, math is **required** to be metaphysical in the West.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Why do math like this?

- ▶ So, math is **required** to be metaphysical in the West.
- ▶ But why should **we** do math like this?

Why do math like this?

- ▶ So, math is **required** to be metaphysical in the West.
- ▶ But why should **we** do math like this?
- ▶ Why **you** do math like this is clear: you believe are inferior, and that you must blindly imitate the superior West.

Why do math like this?

- ▶ So, math is **required** to be metaphysical in the West.
- ▶ But why should **we** do math like this?
- ▶ Why **you** do math like this is clear: you believe are inferior, and that you must blindly imitate the superior West.
- ▶ But why do Westerners do math like that? Why do **they** require math to be metaphysics?

Relation to false history

- ▶ The **false history** of “Euclid” is used to justify this way of doing math.

Relation to false history

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- ▶ The present-day philosophy of math called formalism was developed by Russell and Hilbert who began by “correcting” Euclid.

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- ▶ The present-day philosophy of math called formalism was developed by Russell and Hilbert who began by “correcting” Euclid.
- ▶ However, “Euclid” did not even exist.

Relation to false history

- ▶ The **false history** of “Euclid” is used to justify this way of doing math.
- ▶ The present-day philosophy of math called formalism was developed by Russell and Hilbert who began by “correcting” Euclid.
- ▶ However, “Euclid” did not even exist.
- ▶ I have offered a prize of USD 3000 for serious evidence about “Euclid”.

Relation to false history

- ▶ The **false history** of “Euclid” is used to justify this way of doing math.
- ▶ The present-day philosophy of math called formalism was developed by Russell and Hilbert who began by “correcting” Euclid.
- ▶ However, “Euclid” did not even exist.
- ▶ I have offered a prize of USD 3000 for serious evidence about “Euclid”.
- ▶ Nobody dared to claim that prize so far. And they are too dishonest to admit the truth: that if there is no evidence for Euclid, then Euclid did not even exist.

Bad history to bad philosophy

- ▶ Some people say they don't care about Euclid, the person.

Bad history to bad philosophy

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- ▶ But **bad history leads to bad philosophy.**

Bad history to bad philosophy

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Bad history to bad philosophy

- ▶ Some people say they don't care about Euclid, the person.
- ▶ But **bad history leads to bad philosophy.**
- ▶ **The philosophy attributed to Euclid is actually church theology.**
- ▶ Top Iranian clergy will not propagate church metaphysics, especially if it is anti-Islam. But they do so openly if that metaphysics is attributed to Euclid (and say they don't care whether it was Euclid or someone else).

Bad history to bad philosophy

- ▶ Some people say they don't care about Euclid, the person.
- ▶ But **bad history leads to bad philosophy.**
- ▶ **The philosophy attributed to Euclid is actually church theology.**
- ▶ Top Iranian clergy will not propagate church metaphysics, especially if it is anti-Islam. But they do so openly if that metaphysics is attributed to Euclid (and say they don't care whether it was Euclid or someone else).
- ▶ That someone else is the Crusading church committed to destroying Islam and all other religions by such tricks.

How did the church get into math?

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

**Why should math
be metaphysics?**

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ How and why did the church get into math?

How did the church get into math?

- ▶ How and why did the church get into math?
- ▶ How did it decide the metaphysics underlying present-day math?

How did the church get into math?

- ▶ How and why did the church get into math?
- ▶ How did it decide the metaphysics underlying present-day math?
- ▶ That is a long story.

The meaning of mathematics

- ▶ What is the literal meaning of mathematics?

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The meaning of mathematics

- ▶ What is the literal meaning of mathematics?
- ▶ Mathematics derives from mathesis.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The meaning of mathematics

- ▶ What is the literal meaning of mathematics?
- ▶ Mathematics derives from mathesis.
- ▶ According to Plato, mathesis means arousing the soul to make it recollect its past lives.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The meaning of mathematics

- ▶ What is the literal meaning of mathematics?
- ▶ Mathematics derives from mathesis.
- ▶ According to Plato, mathesis means arousing the soul to make it recollect its past lives.
- ▶ Socrates demonstrates this in the story of the slave boy and the soul, in Plato's *Meno*. He concludes that he has proved the existence of the soul.

The meaning of mathematics

- ▶ What is the literal meaning of mathematics?
- ▶ Mathematics derives from mathesis.
- ▶ According to Plato, mathesis means arousing the soul to make it recollect its past lives.
- ▶ Socrates demonstrates this in the story of the slave boy and the soul, in Plato's *Meno*. He concludes that he has proved the existence of the soul.
- ▶ Plato says in *Republic* that math must be taught not for its practical value, but because math, like music, arouses the soul, and that makes people virtuous.

How and why the church robbed your soul

- ▶ This notion of soul was also prevalent in early Christianity (of Origen).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

How and why the church robbed your soul

- ▶ This notion of soul was also prevalent in early Christianity (of Origen).
- ▶ But this was changed in church theology after the council of Nicea by Augustine et al.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

How and why the church robbed your soul

- ▶ This notion of soul was also prevalent in early Christianity (of Origen).
- ▶ But this was changed in church theology after the council of Nicea by Augustine et al.
- ▶ Nicene council is when church married the state, and changed Christianity to suit its politics.

How and why the church robbed your soul

- ▶ This notion of soul was also prevalent in early Christianity (of Origen).
- ▶ But this was changed in church theology after the council of Nicea by Augustine et al.
- ▶ Nicene council is when church married the state, and changed Christianity to suit its politics.
- ▶ More details in *The Eleven Pictures of Time*, chp. 2 “The curse on ‘cyclic’ time”.

The church and math part 1

- ▶ The church eventually cursed the Platonic notion of soul (552 CE) since that did not offer any special benefits to Christians.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The church and math part 1

- ▶ The church eventually cursed the Platonic notion of soul (552 CE) since that did not offer any special benefits to Christians.
- ▶ Mathematicians like Theon and Hypatia had used mathematics to defend their (Neoplatonic) beliefs about the soul.

The church and math part 1

- ▶ The church eventually cursed the Platonic notion of soul (552 CE) since that did not offer any special benefits to Christians.
- ▶ Mathematicians like Theon and Hypatia had used mathematics to defend their (Neoplatonic) beliefs about the soul.
- ▶ They were brutally killed by church priests, and mathematics and philosophy was banned in Christendom by Justinian in 533 CE.

The church and mathematics part 2

- ▶ The second part of the story is that the church accepted back mathematics during the Crusades: a religious war against Muslims.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The church and mathematics part 2

- ▶ The second part of the story is that the church accepted back mathematics during the Crusades: a religious war against Muslims.
- ▶ Europeans coveted the wealth of Muslim lands, and the church sought it by trying to convert Muslims by force the way Europe was earlier converted by force.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The church and mathematics part 2

- ▶ The second part of the story is that the church accepted back mathematics during the Crusades: a religious war against Muslims.
- ▶ Europeans coveted the wealth of Muslim lands, and the church sought it by trying to convert Muslims by force the way Europe was earlier converted by force.
- ▶ However, the Crusades failed militarily (after the first Crusade and beyond Spain).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The church and mathematics part 2

- ▶ The second part of the story is that the church accepted back mathematics during the Crusades: a religious war against Muslims.
- ▶ Europeans coveted the wealth of Muslim lands, and the church sought it by trying to convert Muslims by force the way Europe was earlier converted by force.
- ▶ However, the Crusades failed militarily (after the first Crusade and beyond Spain).
- ▶ Therefore, the church looked for other means to persuade Muslims.

Aql or reason

- ▶ Muslims accepted reason as in *aql-i-kalam* or Islamic rational theology. (*Aql* is wrongly translated as reason.)

Aql or reason

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- ▶ This was copied and modified. The whole church theology was changed to Christian rational theology of Aquinas.

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- ▶ Muslims accepted reason as in *aql-i-kalam* or Islamic rational theology. (*Aql* is wrongly translated as reason.)
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- ▶ No mention of reason in the Bible, but Christianity became the owner of reason.

Aql or reason

- ▶ Muslims accepted reason as in *aql-i-kalam* or Islamic rational theology. (*Aql* is wrongly translated as reason.)
- ▶ This was copied and modified. The whole church theology was changed to Christian rational theology of Aquinas.
- ▶ No mention of reason in the Bible, but Christianity became the owner of reason.
- ▶ Euclid was promoted to claim ownership of reason via stories of early Greeks which Muslims have swallowed without evidence.

Elements

- ▶ The book *Elements* was hence promoted by the church after the Bible.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Elements

- ▶ The book *Elements* was hence promoted by the church after the Bible.
- ▶ It was said that this book was written to show rational proofs

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Elements

- ▶ The book *Elements* was hence promoted by the church after the Bible.
- ▶ It was said that this book was written to show rational proofs
- ▶ So, the book was used to teach reasoning and persuasion to Christian missionaries.

What the *Elements* is about

- ▶ The book *Elements* is **NOT** about rational or deductive proof.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

What the *Elements* is about

- ▶ The book *Elements* is **NOT** about rational or deductive proof.
- ▶ The very first proposition in the *Elements* uses an empirical proof as does the fourth proposition essential to the whole book.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ The very first proposition in the *Elements* uses an empirical proof as does the fourth proposition essential to the whole book.
- ▶ Western philosophers and thinkers were so foolish that not a single one of them noticed this for **700** years. (And you believe *you* are inferior and must blindly follow Western philosophers!)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Western philosophers and thinkers were so foolish that not a single one of them noticed this for **700** years. (And you believe *you* are inferior and must blindly follow Western philosophers!)
- ▶ Indians understood this immediately, and never bothered to translate the *Elements* until 1723.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Western philosophers and thinkers were so foolish that not a single one of them noticed this for **700** years. (And you believe *you* are inferior and must blindly follow Western philosophers!)
- ▶ Indians understood this immediately, and never bothered to translate the *Elements* until 1723.
- ▶ Formal mathematics arose when Russell and Hilbert changed those proofs (replaced 4th proposition by a postulate) to suit the purported intentions of the mythical Euclid.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Why reason is believed universal

- ▶ Because the church tied reason to theology, it said that reason was universal

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Why reason is believed universal

- ▶ Because the church tied reason to theology, it said that reason was universal
- ▶ because even God was bound by reason

Why reason is believed universal

- ▶ Because the church tied reason to theology, it said that reason was universal
- ▶ because even God was bound by reason
- ▶ but was free to create the facts of his choice.

Why reason is believed universal

- ▶ Because the church tied reason to theology, it said that reason was universal
- ▶ because even God was bound by reason
- ▶ but was free to create the facts of his choice.
- ▶ (This is still the substance of Wittgenstein-Tarski semantics of possible worlds, so when you cite Wittgenstein, you indirectly promote church theology.)

Reason is NOT universal

A second source of religious bias

- ▶ But reason depends upon logic, and the 2-valued logic is NOT universal.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Reason is NOT universal

A second source of religious bias

- ▶ But reason depends upon logic, and the 2-valued logic is NOT universal.
- ▶ Kant foolishly declared that logic has reached perfection based on some unverified stories about Aristotle (of Toledo, whom he confounded with Aristotle of Stagira). He was very parochial and knew nothing about other cultures.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Buddhist and Jain logic are not 2-valued. They are **not even truth-functional**.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Buddhist and Jain logic are not 2-valued. They are **not even truth-functional**.
- ▶ Quantum logic too is not boolean, like the logic of natural language.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

What's the difference?

E.g. Proof by contradiction fails

- ▶ In 2-valued logic, if A is a proposition and $\neg A$ its negation, from “ A and $\neg A$ ” we can infer B for any proposition B . So, a contradiction trivialises any theory, for every proposition is then both true and false.

What's the difference?

E.g. Proof by contradiction fails

- ▶ In 2-valued logic, if A is a proposition and $\neg A$ its negation, from “ A and $\neg A$ ” we can infer B for any proposition B . So, a contradiction trivialises any theory, for every proposition is then both true and false.
- ▶ (Buddhist logic) But if the world is both infinite and not infinite (infinite up and down, and finite across) we cannot deduce anything we like from this.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ (Buddhist logic) But if the world is both infinite and not infinite (infinite up and down, and finite across) we cannot deduce anything we like from this.
- ▶ (Quantum logic) If Schrödinger's cat is both alive and dead, at one instant, that does not trivialise quantum mechanics.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ (Buddhist logic) But if the world is both infinite and not infinite (infinite up and down, and finite across) we cannot deduce anything we like from this.
- ▶ (Quantum logic) If Schrödinger's cat is both alive and dead, at one instant, that does not trivialise quantum mechanics.
- ▶ (Mundane logic) From the statement “This person is both good and bad” we cannot infer the existence of pink elephants.

Mathematics changes with logic

- ▶ But, if logic changes, the theorems of present-day formal mathematics will change.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Mathematics changes with logic

- ▶ But, if logic changes, the theorems of present-day formal mathematics will change.
- ▶ Mathematical theorems are therefore **not** necessary consequences of the postulates, they are not eternal truths as Plato thought, but will vary with logic.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

How should logic be fixed?

- ▶ How should logic be fixed?

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

How should logic be fixed?

- ▶ How should logic be fixed?
- ▶ If it is decided empirically, then empirical proofs cannot be rejected in mathematics

How should logic be fixed?

- ▶ How should logic be fixed?
- ▶ If it is decided empirically, then empirical proofs cannot be rejected in mathematics
- ▶ because an empirically decided logic cannot be superior to facts and cannot provide greater certainty.

How should logic be fixed?

- ▶ How should logic be fixed?
- ▶ If it is decided empirically, then empirical proofs cannot be rejected in mathematics
- ▶ because an empirically decided logic cannot be superior to facts and cannot provide greater certainty.
- ▶ Therefore, logic is decided on cultural grounds (of “superiority”). But that clearly involves a cultural or religious bias.

How this religious bias is spread

- ▶ Through mathematics taught as a compulsory subject in schools, this religious bias is globalised.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

**The Crusades and
math**

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

How this religious bias is spread

- ▶ Through mathematics taught as a compulsory subject in schools, this religious bias is globalised.
- ▶ You are taught to regard empirical proofs of $2+2=4$ as inferior and believe in deductive proofs (from Peano's axioms) as superior.

How this religious bias is spread

- ▶ Through mathematics taught as a compulsory subject in schools, this religious bias is globalised.
- ▶ You are taught to regard empirical proofs of $2+2=4$ as inferior and believe in deductive proofs (from Peano's axioms) as superior.
- ▶ The indoctrinated cannot see the religious bias, and think it will go away if they just keep silent!

A third source of religious bias

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ We have seen two sources of religious bias.

A third source of religious bias

- ▶ We have seen two sources of religious bias.
- ▶ The rejection of empirical proofs as inferior, which is a bias against Islam, Hinduism, Buddhism, etc.

A third source of religious bias

- ▶ We have seen two sources of religious bias.
- ▶ The rejection of empirical proofs as inferior, which is a bias against Islam, Hinduism, Buddhism, etc.
- ▶ Declaring 2-valued logic as universal which is a bias against Buddhism, Jainism, and the logic of most natural languages.

Back to $2+2=4$

- ▶ However, there is a third source of bias: the postulates.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Back to $2+2=4$

- ▶ However, there is a third source of bias: the postulates.
- ▶ According to formal mathematics, you can choose any postulates you like and explore their consequences.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Back to $2+2=4$

- ▶ However, there is a third source of bias: the postulates.
- ▶ According to formal mathematics, you can choose any postulates you like and explore their consequences.
- ▶ For example, in Boolean arithmetic we can have $1+1=1$ (inclusive “or”), or $1+1 = 0$ (exclusive “or”). So, $2+2=2$ or $2+2=0$.

The metaphysics of infinity

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

- ▶ But you are taught only Peano's axioms.

The metaphysics of infinity

- ▶ But you are taught only Peano's axioms.
- ▶ These postulates involves a third source of religious bias.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The metaphysics of infinity

- ▶ But you are taught only Peano's axioms.
- ▶ These postulates involves a third source of religious bias.
- ▶ The metaphysics of infinity which is tied to the church theology of eternity.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

A computer cannot do Peano arithmetic

- ▶ To see that metaphysics of infinity is involved, even in $2+2=4$, try doing Peano arithmetic on a computer or calculator.

A computer cannot do Peano arithmetic

- ▶ To see that metaphysics of infinity is involved, even in $2+2=4$, try doing Peano arithmetic on a computer or calculator.
- ▶ You can do this “correctly”, only until some large number.

A computer cannot do Peano arithmetic

- ▶ To see that metaphysics of infinity is involved, even in $2+2=4$, try doing Peano arithmetic on a computer or calculator.
- ▶ You can do this “correctly”, only until some large number.
- ▶ For example, a calculator with a ten digit display cannot do Peano arithmetic beyond a trillion. (It can only show numbers with ten digits.)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

A computer cannot do Peano arithmetic

- ▶ To see that metaphysics of infinity is involved, even in $2+2=4$, try doing Peano arithmetic on a computer or calculator.
- ▶ You can do this “correctly”, only until some large number.
- ▶ For example, a calculator with a ten digit display cannot do Peano arithmetic beyond a trillion. (It can only show numbers with ten digits.)
- ▶ A similar thing happens with computers.

Makes no practical difference

- ▶ Note: this **makes no practical difference.**

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Makes no practical difference

- ▶ Note: this **makes no practical difference**.
- ▶ All engineering problems can be solved using computers.

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Makes no practical difference

- ▶ Note: this **makes no practical difference**.
- ▶ All engineering problems can be solved using computers.
- ▶ But mathematicians say computer arithmetic is erroneous, because only Peano arithmetic is correct.
- ▶ Why not teach students about the postulates of computer arithmetic? Why Peano's axioms only?

Makes no practical difference

- ▶ Note: this **makes no practical difference**.
- ▶ All engineering problems can be solved using computers.
- ▶ But mathematicians say computer arithmetic is erroneous, because only Peano arithmetic is correct.
- ▶ Why not teach students about the postulates of computer arithmetic? Why Peano's axioms only?
- ▶ (Because they are "superior" since they have the right church metaphysics, regardless of practical value.)

The first creationist controversy

- ▶ The first creationist controversy was not over Darwin, but actually over the notion of infinity.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The first creationist controversy

- ▶ The first creationist controversy was not over Darwin, but actually over the notion of infinity.
- ▶ The symbol for infinity is ∞ , which represents the uroburos: a snake swallowing its own tail.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The first creationist controversy

- ▶ The first creationist controversy was not over Darwin, but actually over the notion of infinity.
- ▶ The symbol for infinity is ∞ , which represents the uroburos: a snake swallowing its own tail.
- ▶ This is a symbol of quasi-cyclic time (used in Platonic and early Christian notion of soul), but cursed by the church.

The first creationist controversy

- ▶ The first creationist controversy was not over Darwin, but actually over the notion of infinity.
- ▶ The symbol for infinity is ∞ , which represents the uroburos: a snake swallowing its own tail.
- ▶ This is a symbol of quasi-cyclic time (used in Platonic and early Christian notion of soul), but cursed by the church.
- ▶ This was used by Proclus, and attacked by John Philoponus since it denies the church doctrine of creation.

“Real numbers”

- ▶ An understanding of the anti-Islamic, anti-Hindu etc. church metaphysics underlying numbers becomes very clear with formal real numbers.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

“Real numbers”

- ▶ An understanding of the anti-Islamic, anti-Hindu etc. church metaphysics underlying numbers becomes very clear with formal real numbers.
- ▶ Formal real numbers are taught in schools along with calculus.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

“Real numbers”

- ▶ An understanding of the anti-Islamic, anti-Hindu etc. church metaphysics underlying numbers becomes very clear with formal real numbers.
- ▶ Formal real numbers are taught in schools along with calculus.
- ▶ These include numbers such as $\sqrt{2} = 1.414\dots$, or numbers like π for which the decimal expansion neither terminates nor recurs.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Infinitesimals

- ▶ How small is the smallest number?

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Infinitesimals

- ▶ How small is the smallest number?
- ▶ In computer arithmetic, called floating point arithmetic, numbers cannot be arbitrarily small.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

**A third source of
bias**

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Infinitesimals

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- ▶ Similarly, al Ashari thought that numbers are atomic.

Infinitesimals

- ▶ How small is the smallest number?
- ▶ In computer arithmetic, called floating point arithmetic, numbers cannot be arbitrarily small.
- ▶ Similarly, al Ashari thought that numbers are atomic.
- ▶ Calculus developed in India with a sophisticated number system involving infinitesimals. (Unexpressed fractions; formally, the non-Archimedean ordered field of rational functions.)

Infinitesimals

- ▶ How small is the smallest number?
- ▶ In computer arithmetic, called floating point arithmetic, numbers cannot be arbitrarily small.
- ▶ Similarly, al Ashari thought that numbers are atomic.
- ▶ Calculus developed in India with a sophisticated number system involving infinitesimals. (Unexpressed fractions; formally, the non-Archimedean ordered field of rational functions.)
- ▶ But our schools only teach formal real numbers which again involves a bias.

Summary

Three sources of bias

- ▶ Thus, there are three sources of religious bias in present-day formal math as taught in schools and universities.

Summary

Three sources of bias

- ▶ Thus, there are three sources of religious bias in present-day formal math as taught in schools and universities.
- ▶ **Rejection of empirical proofs** as inferior, contrary to all systems of Indian philosophy and contrary to Islamic philosophy.

Summary

Three sources of bias

- ▶ Thus, there are three sources of religious bias in present-day formal math as taught in schools and universities.
- ▶ **Rejection of empirical proofs** as inferior, contrary to all systems of Indian philosophy and contrary to Islamic philosophy.
- ▶ **Just declaring 2-valued logic as universal.** This **cannot** be established empirically (without abandoning formal math). Further, this involves a cultural bias against Buddhism, Jainism, etc.

Summary

Three sources of bias

- ▶ Thus, there are three sources of religious bias in present-day formal math as taught in schools and universities.
- ▶ **Rejection of empirical proofs** as inferior, contrary to all systems of Indian philosophy and contrary to Islamic philosophy.
- ▶ **Just declaring 2-valued logic as universal.** This **cannot** be established empirically (without abandoning formal math). Further, this involves a cultural bias against Buddhism, Jainism, etc.
- ▶ **Only some postulates selected by Western philosophers are actually taught.** This involves a particular metaphysics of infinity aligned to the church (political) notion of eternity.

What's the alternative?

- ▶ Is there an alternative?

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

What's the alternative?

- ▶ Is there an alternative?
- ▶ Here again it is important to reject false history.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

What's the alternative?

- ▶ Is there an alternative?
- ▶ Here again it is important to reject false history.
- ▶ We heard yesterday, math developed in the West (starting from Euclid). If so, an alternative would be hard.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

What's the alternative?

- ▶ Is there an alternative?
- ▶ Here again it is important to reject false history.
- ▶ We heard yesterday, math developed in the West (starting from Euclid). If so, an alternative would be hard.
- ▶ But this is completely false.

The correct history

- ▶ All school math (arithmetic, algebra, geometry, trigonometry, calculus, probability and statistics) actually developed in the **non**-West.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The correct history

- ▶ All school math (arithmetic, algebra, geometry, trigonometry, calculus, probability and statistics) actually developed in the **non**-West.
- ▶ It developed for practical reasons.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The correct history

- ▶ All school math (arithmetic, algebra, geometry, trigonometry, calculus, probability and statistics) actually developed in the **non**-West.
- ▶ It developed for practical reasons.
- ▶ It was imported to the West also for practical reasons.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Copied and misunderstood

- ▶ (Mystery) Geometry originated in Egypt, it was copied by Plato, reinterpreted by the church.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ The same thing happened with arithmetic.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Copied and misunderstood

- ▶ (Mystery) Geometry originated in Egypt, it was copied by Plato, reinterpreted by the church.
- ▶ The same thing happened with arithmetic.
- ▶ Greeks and Romans had **primitive** number systems.

Copied and misunderstood

- ▶ (Mystery) Geometry originated in Egypt, it was copied by Plato, reinterpreted by the church.
- ▶ The same thing happened with arithmetic.
- ▶ Greeks and Romans had **primitive** number systems.
- ▶ Try multiplying XXVII with XXXIII. (Does anyone know how to do it? Can it be done in less than an hour?)

Copied and misunderstood

- ▶ (Mystery) Geometry originated in Egypt, it was copied by Plato, reinterpreted by the church.
- ▶ The same thing happened with arithmetic.
- ▶ Greeks and Romans had **primitive** number systems.
- ▶ Try multiplying XXVII with XXXIII. (Does anyone know how to do it? Can it be done in less than an hour?)
- ▶ (Hence, Greeks did not develop any science or astronomy: that history is completely false.

The real history

- ▶ The real history is quite different.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The real history

- ▶ The real history is quite different.
- ▶ Just as Western philosophers made a foolish mistake about geometry (recall first proposition of *Elements*)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The real history

- ▶ The real history is quite different.
- ▶ Just as Western philosophers made a foolish mistake about geometry (recall first proposition of *Elements*)
- ▶ they made all sorts of foolish mistakes about the mathematics they imported from India.

How the West misunderstood math

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

- ▶ In fact, most elementary math (arithmetic, algebra, trigonometry, calculus, probability)

How the West misunderstood math

- ▶ In fact, most elementary math (arithmetic, algebra, trigonometry, calculus, probability)
- ▶ travelled to the West where it was misunderstood.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

How the West misunderstood math

- ▶ In fact, most elementary math (arithmetic, algebra, trigonometry, calculus, probability)
- ▶ travelled to the West where it was misunderstood.
- ▶ let us see some examples.

The word “algorithm”

Arabic numerals

- ▶ The word algorithm comes from al Khwarizmi

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The word “algorithm”

Arabic numerals

- ▶ The word algorithm comes from al Khwarizmi
- ▶ whose Latin name was Algorismus.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The word “algorithm”

Arabic numerals

- ▶ The word algorithm comes from al Khwarizmi
- ▶ whose Latin name was Algorismus.
- ▶ His book “Hisab al Hind” made this arithmetic famous.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ His book “Hisab al Hind” made this arithmetic famous.
- ▶ Earlier Europeans only had Roman numerals and the abacus. This kindergarten toy was the acme of mathematics in Europe in the 10th c. and a pope (Pope Sylvester 2) wrote a book on the abacus.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ “Arabic numerals” were imported from Cordoba by the same Gerbert **who misunderstood them.**

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The pope's mistake

- ▶ Thus, the pope was accustomed to arithmetic with an abacus.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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The pope's mistake

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- ▶ Hence, he thought all arithmetic can only be done on an abacus
- ▶ so he got a special abacus constructed for “Arabic numerals”
- ▶ This was a grave misunderstanding for it defeats the whole purpose of arithmetic algorithms.
- ▶ See a picture of Gerbert's apices from a text of 976 CE in *Euclid and Jesus* p. 119 (pdf p. 133).

The word “zero”

- ▶ However, Florentine merchants understood that better arithmetic skills gives a commercial advantage.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The word “zero”

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- ▶ (E.g. how do you quickly evaluate two different schemes for a sim card?)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The word “zero”

- ▶ However, Florentine merchants understood that better arithmetic skills gives a commercial advantage.
- ▶ (E.g. how do you quickly evaluate two different schemes for a sim card?)
- ▶ They used algorismus and wrote books on it (like Fibonacci's *Liber Abaci*.)

The word zero

from cypher or sifr

- ▶ The average Europeans were greatly puzzled

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ because Roman numerals are additive ($XII = X + I + I$)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ but “Arabic numerals” are not: $10 \neq 1 + 0$.
- ▶ Hence, they said “zero” is something mysterious: it has no value in itself, but adds any amount of value to the preceding number, as in 100000.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ but “Arabic numerals” are not: $10 \neq 1 + 0$.
- ▶ Hence, they said “zero” is something mysterious: it has no value in itself, but adds any amount of value to the preceding number, as in 100000.
- ▶ The word for zero comes from zephyr, **cipher**, sifr, and cypher means a mysterious code! Alarmed by “Arabic numerals”, Florence passed a law that numbers in a contract must also be written in words.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Why is $\sqrt{2}$ deaf?

Surds

- ▶ Today in school you learn about surds

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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Surds

- ▶ Today in school you learn about surds
- ▶ like $\sqrt{2}$ (which do not have “rational” roots).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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Surds

- ▶ Today in school you learn about surds
- ▶ like $\sqrt{2}$ (which do not have “rational” roots).
- ▶ The word “surd” comes from the Latin *surdus*, meaning deaf.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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Surds

- ▶ Today in school you learn about surds
- ▶ like $\sqrt{2}$ (which do not have “rational” roots).
- ▶ The word “surd” comes from the Latin *surdus*, meaning deaf.
- ▶ So, why is $\sqrt{2}$ deaf?

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Why is $\sqrt{2}$ deaf?

- ▶ The diagonal of a square is the square root.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ The diagonal of a square is the square root.
- ▶ The Sanskrit word for diagonal is *karṇa*.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Why is $\sqrt{2}$ deaf?

- ▶ The diagonal of a square is the square root.
- ▶ The Sanskrit word for diagonal is *karṇa*.
- ▶ This is also the word for ear.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ The diagonal of a unit square is $\sqrt{2}$ which was declared a “bad” *karṇa*

Why is $\sqrt{2}$ deaf?

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- ▶ The Sanskrit word for diagonal is *karṇa*.
- ▶ This is also the word for ear.
- ▶ The diagonal of a unit square is $\sqrt{2}$ which was declared a “bad” *karṇa*
- ▶ translated as “bad ear”, hence deaf!

The word “sine”

Toledo translations

- ▶ Much Western knowledge originates from the Toledo translations of 1125.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ Much Western knowledge originates from the Toledo translations of 1125.
- ▶ The Toledo translators consisted of two sets of translators:

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ And the Great Translator who translated into Latin.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ The Toledo translators consisted of two sets of translators:
- ▶ Jews and Mozharabs who translated from Arabic to a Romance language
- ▶ And the Great Translator who translated into Latin.
- ▶ Neither knew any math.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Where is the fold?

- ▶ The trigonometric function \sin

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Where is the fold?

- ▶ The trigonometric function \sin
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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Where is the fold?

- ▶ The trigonometric function \sin
- ▶ derives from the Latin *sinus*
- ▶ meaning fold.
- ▶ What fold are we talking about?

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The word “sine”

continued

- ▶ The sin relates to the (half-) chord of a circle. The Sanskrit word for “sine” (or half chord) is *jyā* (or *ardha-jyā*, i.e., half *jyā*).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ written as the consonantal skeleton *jb*

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ In the vernacular *jyā* was phonetically simplified to *jīvā*
- ▶ or in Arabic as *jībā*
- ▶ written as the consonantal skeleton *jb*
- ▶ wrongly read as *jaib* meaning pocket = fold in dress = fold = sinus.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

The word “trigonometry”

- ▶ The word trigonometry means measurement of a triangle.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

The word “trigonometry”

- ▶ The word trigonometry means measurement of a triangle.
- ▶ The trigonometric functions can indeed be used to measure heights and triangles.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ The trigonometric functions can indeed be used to measure heights and triangles.
- ▶ But the term $jyā = \text{chord}$ relates to a circle and to circle-metry, as does the number π .

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ The trigonometric functions can indeed be used to measure heights and triangles.
- ▶ But the term $jyā = \text{chord}$ relates to a circle and to circle-metry, as does the number π .
- ▶ Today sine and cosine are (badly) defined using triangles. (With some Greek thrown in as in $\sin \theta$.)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ But the term $jyā = \text{chord}$ relates to a circle and to circle-metry, as does the number π .
- ▶ Today sine and cosine are (badly) defined using triangles. (With some Greek thrown in as in $\sin \theta$.)
- ▶ This is wrong, because these functions are defined with regard to a circle, not a triangle. (E.g. what is $\sin 120^\circ$?)

Calculus

- ▶ Recall that the calculus developed in India

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Calculus

- ▶ Recall that the calculus developed in India
- ▶ and was taken to Europe in the 16th c. by Jesuits based in Cochin (in south India) where they had started a college by 1550,

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ and were trying to duplicate the Toledo model of translating local texts and sending them back to Europe.

Calculus

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- ▶ and was taken to Europe in the 16th c. by Jesuits based in Cochin (in south India) where they had started a college by 1550,
- ▶ and were trying to duplicate the Toledo model of translating local texts and sending them back to Europe.
- ▶ As usual, this new knowledge was not properly understood.

Descartes' blunder

- ▶ While some European mathematicians (Pascal, Fermat) were enthusiastic about it

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Descartes' blunder

- ▶ While some European mathematicians (Pascal, Fermat) were enthusiastic about it
- ▶ Descartes rejected it, saying that measuring a curved line was beyond the capacity of the human mind.

Descartes' blunder

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- ▶ Descartes rejected it, saying that measuring a curved line was beyond the capacity of the human mind.
- ▶ *the ratios between straight and curved lines are not known, and I believe cannot be discovered by human minds, and therefore no conclusion based upon such ratios can be accepted as rigorous and exact.* (Descartes, *Geometry, reprint, 1996, Book 2, p. 544*)

Descartes' blunder

- ▶ For some curious metaphysical reason, Descartes thought it OK to measure straight lines, but not curved lines.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ This metaphysics is encouraged in school, where you learnt geometry with a compass box which has instruments to measure straight lines, but none to measure curved lines.

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- ▶ For some curious metaphysical reason, Descartes thought it OK to measure straight lines, but not curved lines.
- ▶ This metaphysics is encouraged in school, where you learnt geometry with a compass box which has instruments to measure straight lines, but none to measure curved lines.
- ▶ However, any child can measure curved lines with a string, which can be straightened out to compare with a straight line.

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- ▶ For some curious metaphysical reason, Descartes thought it OK to measure straight lines, but not curved lines.
- ▶ This metaphysics is encouraged in school, where you learnt geometry with a compass box which has instruments to measure straight lines, but none to measure curved lines.
- ▶ However, any child can measure curved lines with a string, which can be straightened out to compare with a straight line.
- ▶ This was how it was done in India with the *śulba sūtra* or aphorisms on the string. (*śulba* means string.)

Explaining Descartes' blunder

- ▶ The key “ratio of curved and straight lines” is the number π = ratio of circumference to diameter.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Explaining Descartes' blunder

- ▶ The key “ratio of curved and straight lines” is the number π = ratio of circumference to diameter.
- ▶ This was obtained in India as an infinite series (today called Leibniz series)

$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots \quad (1)$$

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ (Known even then to be not the best technique for calculating π , since it is very “slowly convergent”.)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ (Known even then to be not the best technique for calculating π , since it is very “slowly convergent”.)
- ▶ Descartes thought that the only way to sum this infinite series was to physically carry out the infinite sum which would take an infinite amount of time.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots \quad (1)$$

- ▶ (Known even then to be not the best technique for calculating π , since it is very “slowly convergent”.)
- ▶ Descartes thought that the only way to sum this infinite series was to physically carry out the infinite sum which would take an infinite amount of time.
- ▶ This blunder was religiously motivated, on the belief that math should be perfect, since the tail end of the series can be neglected for all practical purposes.

[Outline](#)[Introduction](#)[What is decolonization?](#)[Why should math be metaphysics?](#)[Mathesis](#)[The Crusades and math](#)[A third source of bias](#)[What's the alternative?](#)[What the West did](#)[Petition to teach religiously neutral math](#)

Newton's misunderstanding

- ▶ Newton thought that the only way to make sense of $\frac{d}{dt}$ was to suppose that time t “flows”.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

Newton's misunderstanding

- ▶ Newton thought that the only way to make sense of $\frac{d}{dt}$ was to suppose that time t “flows”.
- ▶ Today this is taught as the belief that for the derivative $\frac{d}{dt}$ to make sense time t must be a continuum (like formal real numbers).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Today this is taught as the belief that for the derivative $\frac{d}{dt}$ to make sense time t must be a continuum (like formal real numbers).
- ▶ To make calculus perfect, Newton made time metaphysical, and this led to an error in his physics.

Probability

- ▶ The situation about probability is similar.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ The situation about probability is similar.
- ▶ It is still not understood in the West. The best they have is Kolmogorov probabilities, which is not good enough.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

**What's the
alternative?**

What the West did

Petition to teach
religiously neutral
math

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- ▶ (See my article on “Probability in Ancient India” in Elsevier Handbook of Philosophy of Statistics.)

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Won't go into details of that.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

What the West did

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What the West did

- ▶ On the mathesis view, Plato had thought that mathematics was best suited to arouse the soul because he believed math involved eternal truths which aroused the soul by sympathetic magic.
- ▶ This belief in math as eternal truth persisted even after the church reinterpreted math during the crusades (as related to rational persuasion or proof)
- ▶ It was believed that math is the perfect language in which God wrote the eternal laws of nature. (Eternal laws require such a language.)

Theological layer on imported math

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- ▶ They thought this perfection was possible only through metaphysics (as in Newton's mistake).
- ▶ Hence, they made math metaphysical and brought in the metaphysics of infinity.
- ▶ That is, they gave a theological coating to the math they imported (viz. geometry, arithmetic, algebra, trigonometry, calculus, probability etc.)

Re-export during colonialism

- ▶ This theologically coated math was re-exported as “superior” during colonialism.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ This theologically coated math was re-exported as “superior” during colonialism.
- ▶ This theological coating or metaphysics is irrelevant to any practical application of math.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Re-export during colonialism

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- ▶ This theological coating or metaphysics is irrelevant to any practical application of math.
- ▶ E.g. an engineer can do all calculations without ever hearing of Peano’s axioms.

Handmaiden of science

- ▶ So, the alternative to religiously biased Western math is easy.

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Just remove the theological coating, and go back to the practical value of math.

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Handmaiden of science

- ▶ So, the alternative to religiously biased Western math is easy.
- ▶ Just remove the theological coating, and go back to the practical value of math.
- ▶ No other (“intrinsic” or “spiritual” or “aesthetic”) value in math. Math is the handmaiden of the science, not the queen.

Already done

- ▶ This has already been done.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Already done

- ▶ This has already been done.
- ▶ E.g. course on “calculus without limits.”
- ▶ Actual teaching experiments have been performed.
- ▶ Students find the resulting math easy, since there is no complex underlying metaphysics.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ E.g. calculus is done as numerical solution of ordinary differential equations

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ See e.g. pendulum project (google: “exact motion of simple pendulum raju”).

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Summary

- ▶ Math imported into West from non-West

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Math imported into West from non-West
- ▶ Given a coating of metaphysics and re-exported and globalised during colonialism.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Math imported into West from non-West
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Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

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- ▶ Math imported into West from non-West
- ▶ Given a coating of metaphysics and re-exported and globalised during colonialism.
- ▶ Alternative is to eliminate that metaphysics, and make math religiously neutral.
- ▶ This has already been done. It makes math easy.

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

Petition to teach
religiously neutral
math

Teach religiously neutral math

- ▶ The problem now is implementation.

Decolonizing
mathematics

C. K. Raju

Outline

Introduction

What is
decolonization?

Why should math
be metaphysics?

Mathesis

The Crusades and
math

A third source of
bias

What's the
alternative?

What the West did

**Petition to teach
religiously neutral
math**

Teach religiously neutral math

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- ▶ Teaching a religiously biased math as a compulsory subject in public schools is unconstitutional in my country (as it is in the US).
- ▶ Note the term religiously neutral which is different from secular.