Mathematics for Humanity

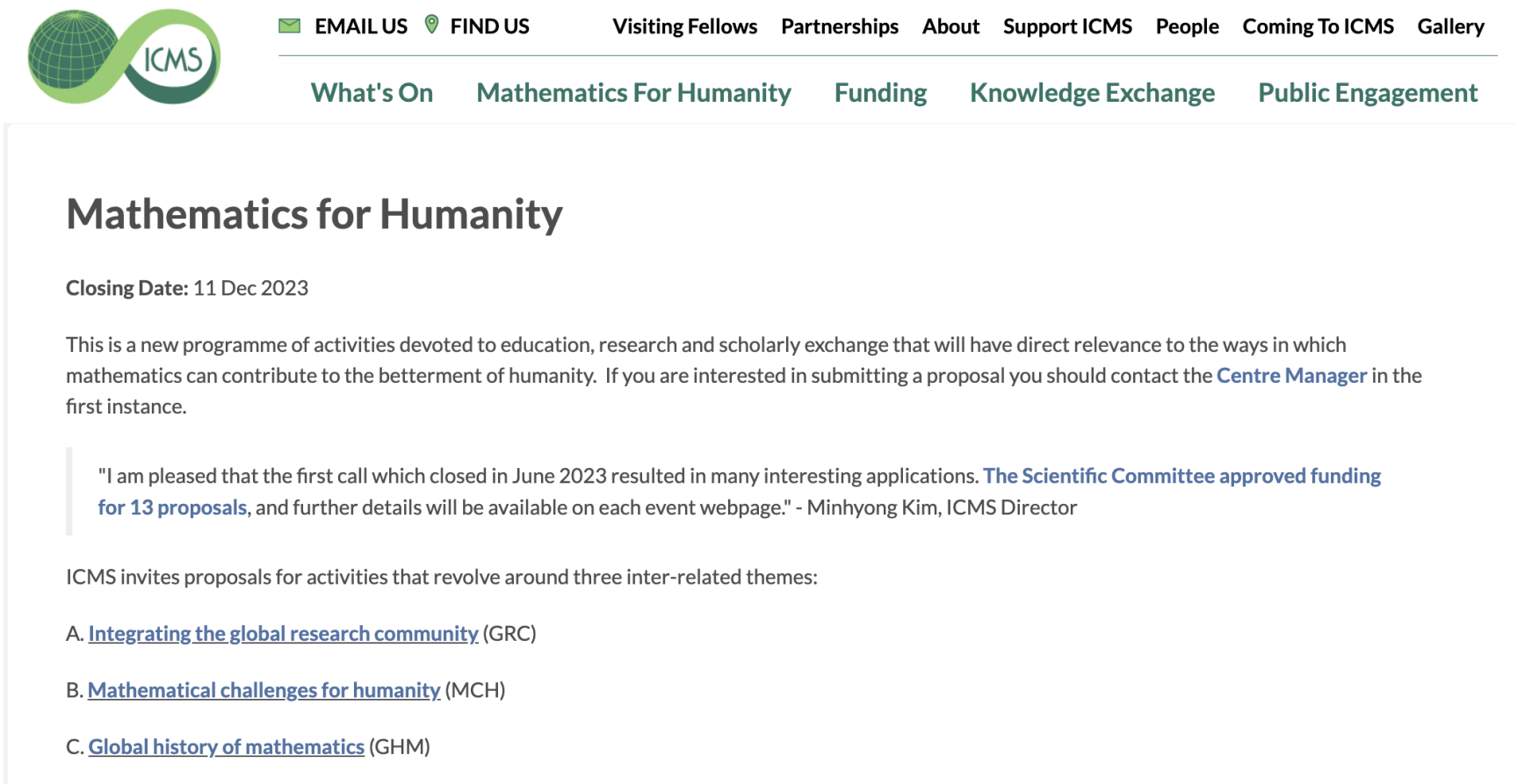


Figure: Mathematics for Humanity, a project of the ICMS Edinburgh

Mathematics for Humanity

post-graduate students and early career researchers.

Submission Guidelines

Scientific Committee

The programme will be overseen by a specialised Scientific Committee (a sub-committee of the ICMS Programme Comı the assessment of all submissions and will support the Director in the selection of proposals.

John Baez (UC Riverside)

Karine Chemla (Paris)

Sophie Dabo (Lille)

Nalini Joshi (Sydney)

Reviel Netz (Stanford)

Bao Chau Ngo (Chicago and VIASM)

Raman Parimala (Emory)

Fernando Rodriguez Villegas (ICTP, Trieste)

Emily Shuckburgh (Cambridge)

Terence Tao (UCLA)

Support Mathematics for Humanity

The Mathematics for Humanity Project of the International Centre for Mathematical Sciences supports the effort by m betterment of humanity. It accepts a wide range of proposals with concentration on three themes.

Figure: Mathematics for Humanity, a project of the ICMS Edinburgh

Mathematics for Humanity: Programme 2024

'Exploring scaling of mass extinction events for climate tipping point modelling', Ivan Sudakov (Open University)

'Mathematics of voting and representation', Ismar Volic (Wellesley College, Boston)

'Social Justice and Economic Recovery Mathematics', Chris Budd (Bath)

'Compositional game theory for governance design', Jules Hedges (Strathclyde)

'Mathematical modelling for 21st century decisions', Erica Thompson (LSE)

'Algebra and geometry from Africa', G. Sankaran (Bath)

Mathematics for Humanity: Programme 2024

'Coupling Mathematical Modelling and Computer Modelling Approaches to Support Flood Inundation Prediction: A Case Study of Dong Hoi City, Quang Binh Province', Nguyen Hu Du (VIASM)

'Current research on the history of mathematics in the ancient world: new questions and new approaches', Karine Chemla (Univ. Paris SPHERE)

'A global history of eclipse reckoning', D. Kent (St. Andrews)

'Supporting the Development of Mathematical Resilience Globally', S. Johnston-Wilder (Warwick)

'UK-Middle East Winter School on Mathematical Physics', Ofer Aharony (Weizmann Institute)

'Rewilding Mathematics', M. Singer (UCL)

Who Owns Mathematics: A Question of Identity

Minhyong Kim
International Centre for Mathematical Sciences
Maxwell Institute for Mathematical Sciences

November, 2023
Topos Institute

Mathematics is a Timeless, Borderless Adventure

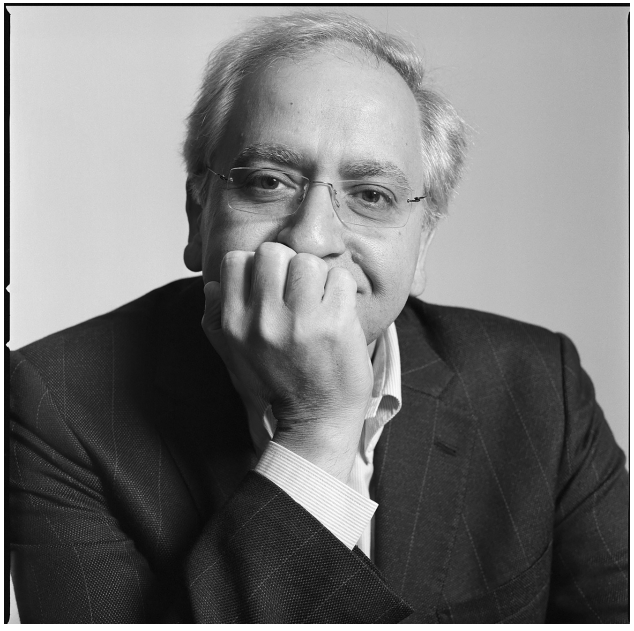


Figure: Cumrun Vafa, Mathematical Physicist

"...science is a timeless, borderless adventure. If we take a snapshot of science today we'll see various centers of excellence, and some places that may be relatively quiet, but we should view this as not the property of science, but as transient phenomena. Sometimes science is strong in one place, sometimes in the other. It is not a territory of a particular area, and it's not a territory of a particular people, it's an adventure for the entire human kind."

Square Roots: The Babylonian Algorithm

Figure: YBC 7289 (1800-1600 BCE)

Babylonian approximation:

$$\sqrt{2} \approx 1.41421297$$

Value in today's calculator:

$$\sqrt{2} \approx 1.41421356$$

To calculate $\sqrt{D}$ start with any guess a_1.

Then put

$$a_2 = (1/2)(a_1 + D/a_1);$$

$$a_3 = (1/2)(a_2 + D/a_2);$$

$$a_4 = (1/2)(a_3 + D/a_3);$$

$$\vdots$$

Square Roots: The Babylonian Algorithm

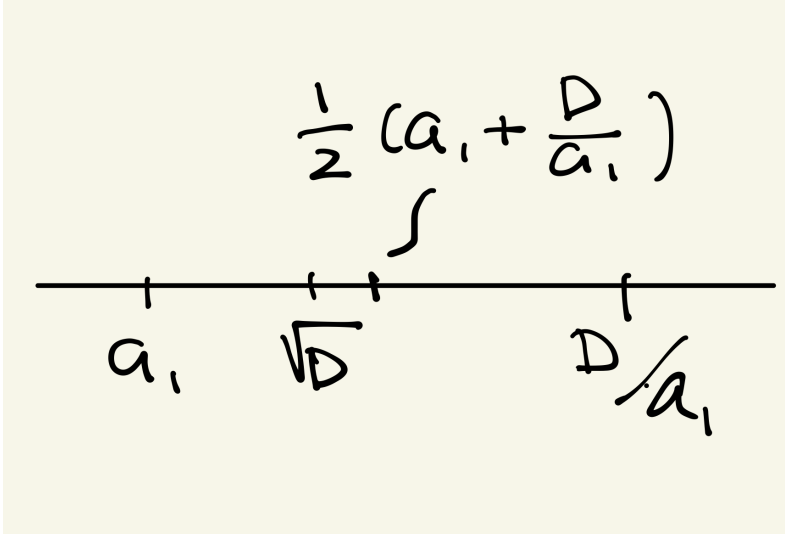
For example, for $\sqrt{2}$, $a_1 = 1$.

$$a_2 = (1/2)(1 + 2) = 3/2 = 1.5$$

$$a_3 = (1/2)(3/2 + 4/3) = (1/2)(17/6) = 17/12 \approx 1.41666667$$

$$a_4 = (1/2)(17/12 + 24/17) = (1/2)(577/204) \approx 1.41421568$$

Babylonian Algorithm for Finding Square Roots



If $a_1 < \sqrt{D}$, then $D/a_1 > \sqrt{D}$, since

$$a_1 \cdot \frac{D}{a_1} = D$$

$$\sqrt{D} \cdot \sqrt{D} = D$$

Thus, $a_2 = (1/2)(a_1 + D/a_1)$ is closer to $\sqrt{D}$ than either.

Square Roots: The Babylonian Algorithm

The Babylonian algorithm was generalised by

–*Nine Chapters on the Mathematical Art* 九章算术 (10C BCE to 2C BCE)

–Heron of Alexandria (1C)

–Wang Xiaotong (7C)

–Brahmagupta (7C)

–Omar Khayaam (11C)

–Sharaf al-Din al-Tusi (12C)

–Jamshid al-Kashi (15C)

–Viete (16C)

–Newton and Raphson (17C)

–Gauss (19C)

Square Roots: The Babylonian Algorithm

A full understanding of this method came to be achieved only in the 21st century in a paper by John Hubbard, Dierk Schleicher, Scott Sutherland.

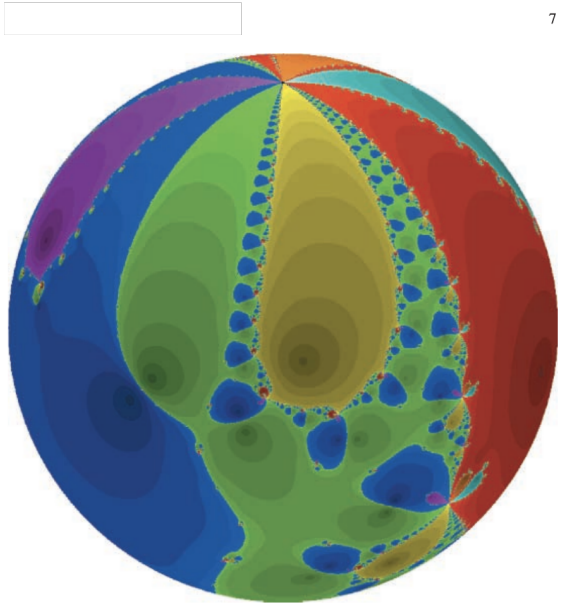


Figure: How to find all roots of complex polynomials by Newton's method (Inventiones Mathematica 2001)

Concluded nearly 4000 years of collective research.

Identities

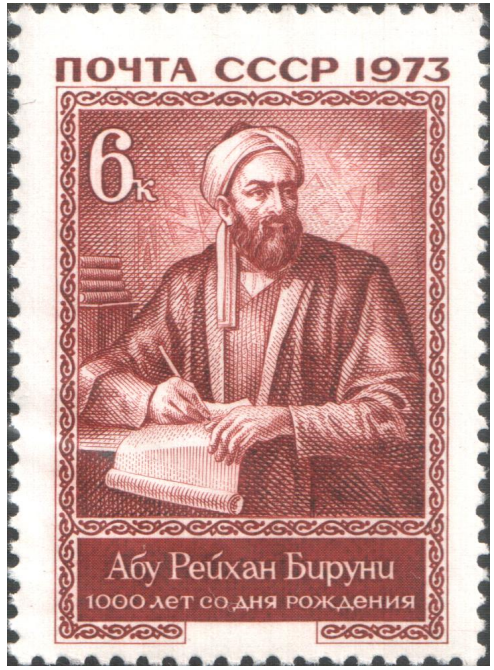


Figure: Abu Rayhan Muhammad ibn Ahmad al-Biruni (973-1050)

Used this method to calculate the radius of the earth to within 1% accuracy.

$$\cos(x) = \sqrt{\frac{1+\cos(2x)}{2}}.$$

Identities

Was al-Biruni Soviet?

Was he Uzbek?

Was he Iranian?

Was he Persian?

Was he Arabic?

Identities: Misconceptions

A.N. Whitehead *An Introduction to Mathematics* (1911):

> *The death of Archimedes by the hands of a Roman soldier is symbolical of a world-change of the first magnitude: the theoretical Greeks, with their love of abstract science, were superseded in the leadership of the European world by the practical Romans.*

Why were there no Roman mathematicians?

Some mathematicians of the Roman empire:

Heron (1C)
Ptolemy (2C)
Diophantus (3C)

There were no Roman mathematicians because they were defined out of existence.

Identities: Misconceptions

Why were Greeks and Romans 'leaders of the European world'?

Aristotle's Politics, Book 7, 127b:

> *'The nations inhabiting the cold places and those of Europe are full of spirit but somewhat deficient in intelligence and skill, so that they continue comparatively free, but lacking in political organization and capacity to rule their neighbors. The peoples of Asia on the other hand are intelligent and skillful in temperament, but lack spirit, so that they are in continuous subjection and slavery. But the Greek race participates in both characters, just as it occupies the middle position geographically, for it is both spirited and intelligent; hence it continues to be free and to have very good political institutions, and to be capable of ruling all mankind if it attains constitutional unity.'*

Identities: Misconceptions

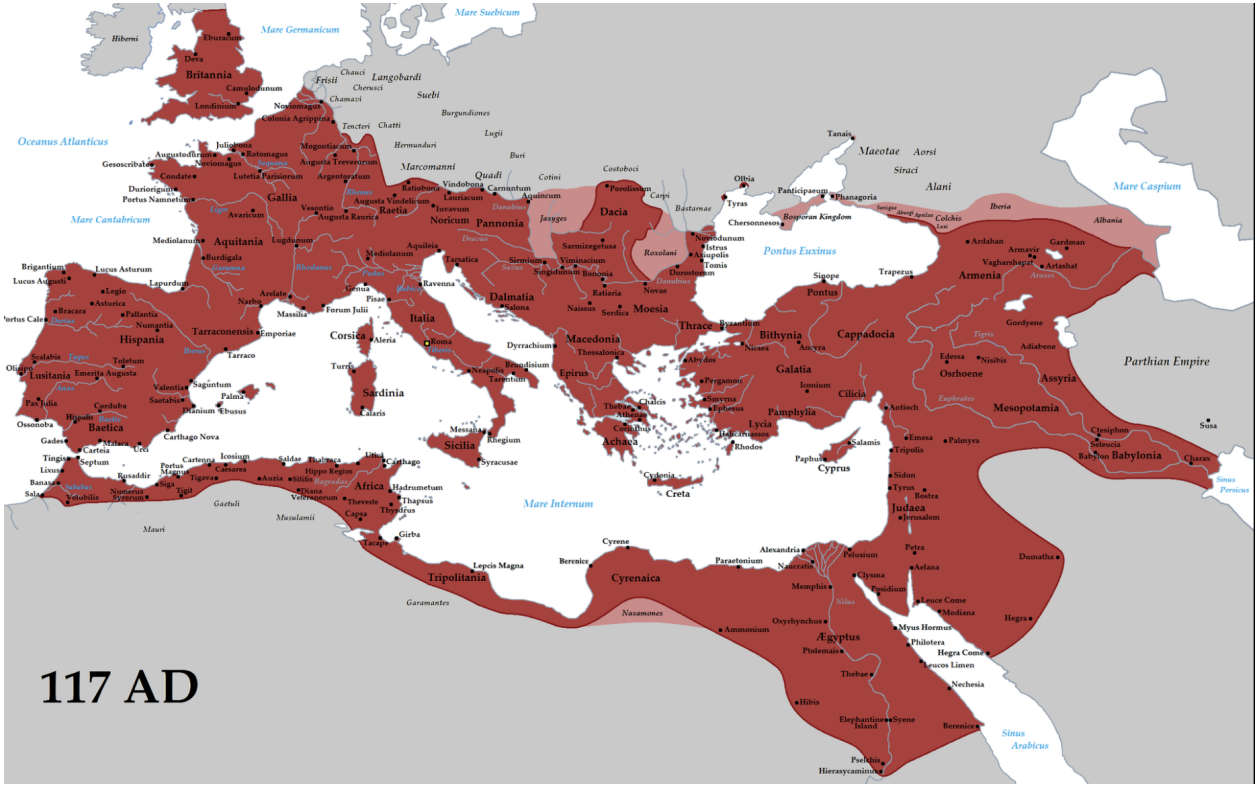


Figure: Roman Empire, early 2nd century

Identities: Misconceptions

Figure: Roman Empire, early 7th century

Identities: Misconceptions

Thomas Jefferson, *Notes on the State of Virginia* (1785):

> *Comparing them by their faculties of memory, reason, and imagination, it appears to me, that in memory they are equal to the whites; in reason much inferior, as think one could scarcely be found capable of tracing and comprehending the investigations of Euclid.*

In fact, no one knows anything about about Euclid's ethnicity.

All we know is that they probably lived all their life in Africa.

Identities: Misconceptions

This is typical of many mathematicians of the ancient world:

Thales lived in present day Turkey.

Pythagoras was born in Samos, but lived and studied all around the Mediterranean.

Erathostenes was born and lived in present day Libya.

Heron, Ptolemy, and Diophantus were born and lived in present day Egypt.

Identities: Misconceptions

Roderick Beaton, *The Greeks: A Global History* (2021):

> *The Greeks of the title and the pages that follow are to be understood as* **speakers of the Greek language**.

Most of Albiruni's works were written in Arabic.

Newton's major works were written in Latin.

We will all be included in a book on the global history of the English written by a future historian.

Identities: Misconceptions

G.H. Hardy *A Mathematician's Apology* (1940):

> *'The Greeks were the first mathematicians who are still 'real' to us to-day. Oriental mathematics may be an interesting curiosity, but Greek mathematics is the real thing. The Greeks first spoke a language which modern mathematicians can understand: as Littlewood said to me once, they are not clever schoolboys or 'scholarship candidates', but 'fellows of another college'.'*

Identities: Complexity

Figure: *The Conspiracy of Claudius Civilis* (1661-62), Rembrandt, Swedish National Museum

Identities: Complexity

Figure: Herman (Arminius) Monument (1838-1875), Ernst von Bandel,Teutoburg Forest

Identities: Complexity

Figure: Vercingetorix Monument (1865), Aimé Millet, Alesia

History is Now

The Quality Assurance Agency for Higher Education (QAA):

> *'As the independent body entrusted with monitoring and advising on standards and quality in UK higher education...We work with governments, agencies and institutions globally to benefit UK higher education and its international reputation.'*

The QAA recently issued the 2022 subject benchmark for mathematics, statistics, and operational research (MSOR):

> *The curriculum should present a multicultural and decolonised view of MSOR, informed by the student voice. Where possible, it should present the work of a diverse group of MSOR practitioners.*

The response of a number of distinguished mathematicians was the **mathematics is universal**.

Conclusion

Whitehead lived in a milieu where some Europeans had claimed the ancient Greco-Roman tradition by embracing and studying it. This was correlated with complicated identity politics in a Europe moving towards modernity.

This is common: people create their tradition out of what they admire or dislike from the past.

Mathematics now belongs to whomever studies and uses it.

Europeans who claimed the ancient Greco-Roman tradition were no intrinsically closer to it than many Africans now.

To really convince the global community of this, academics must educate themselves on current research into an accurate history of the ancient world.

In particular, we need to acquire and disseminate an accurate view of the history of mathematics.

We as mathematicians have nothing to lose and much to gain.

Current Research

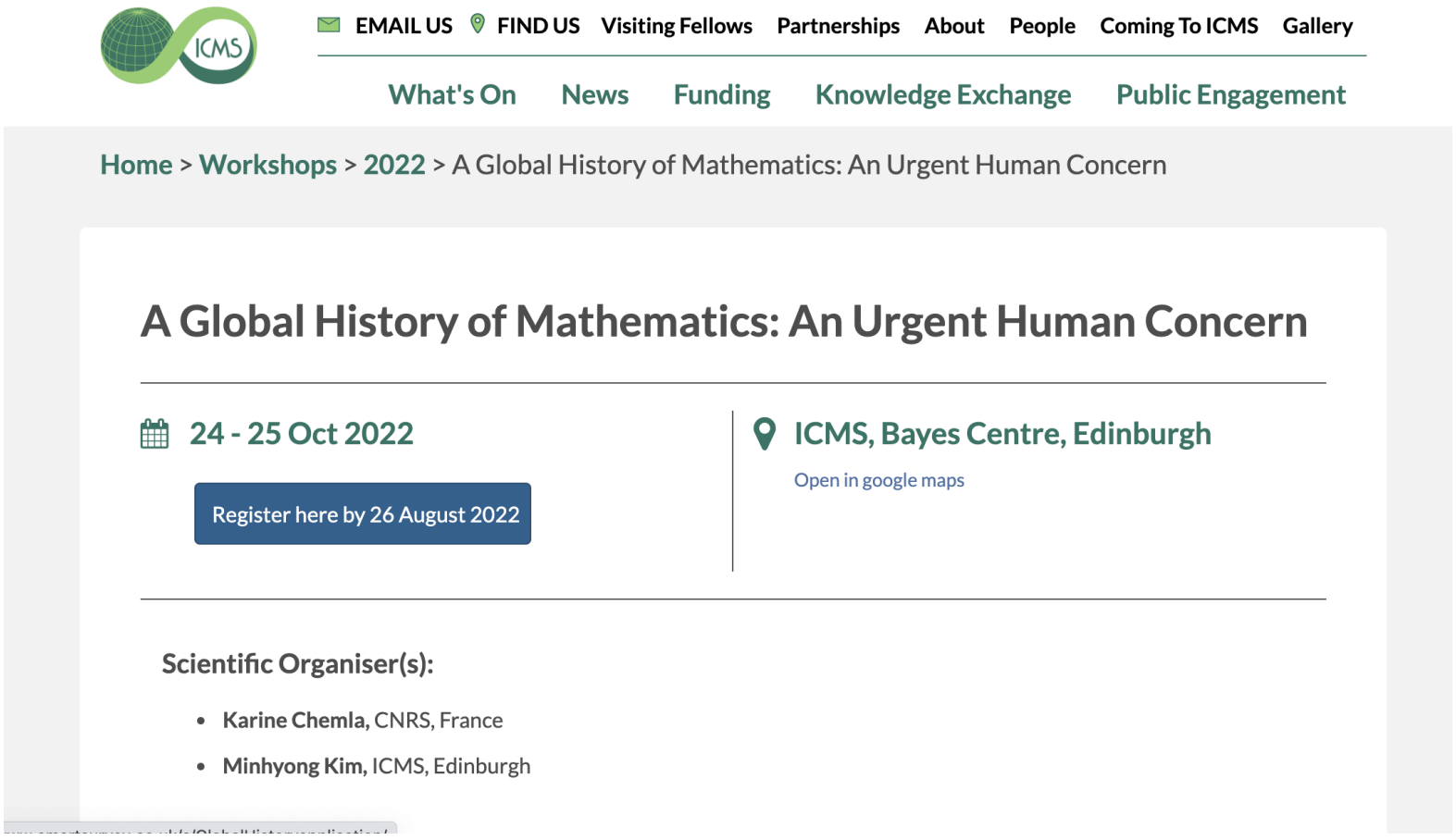
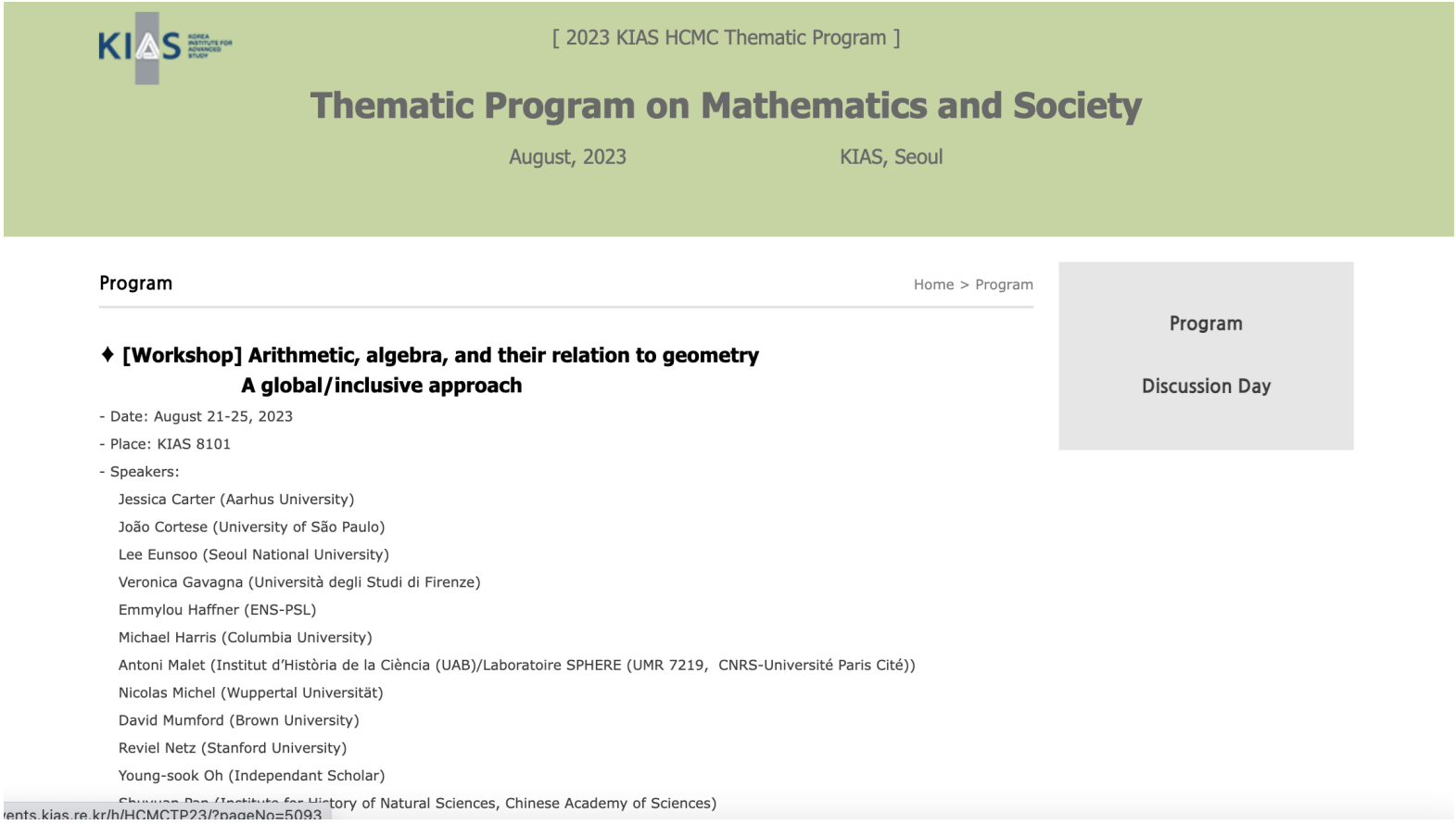


Figure: Workshop at the ICMS, October, 2022

Current Research



[2023 KIAS HCMC Thematic Program]

Thematic Program on Mathematics and Society

August, 2023 KIAS, Seoul

Program

Home > Program

Program

Discussion Day

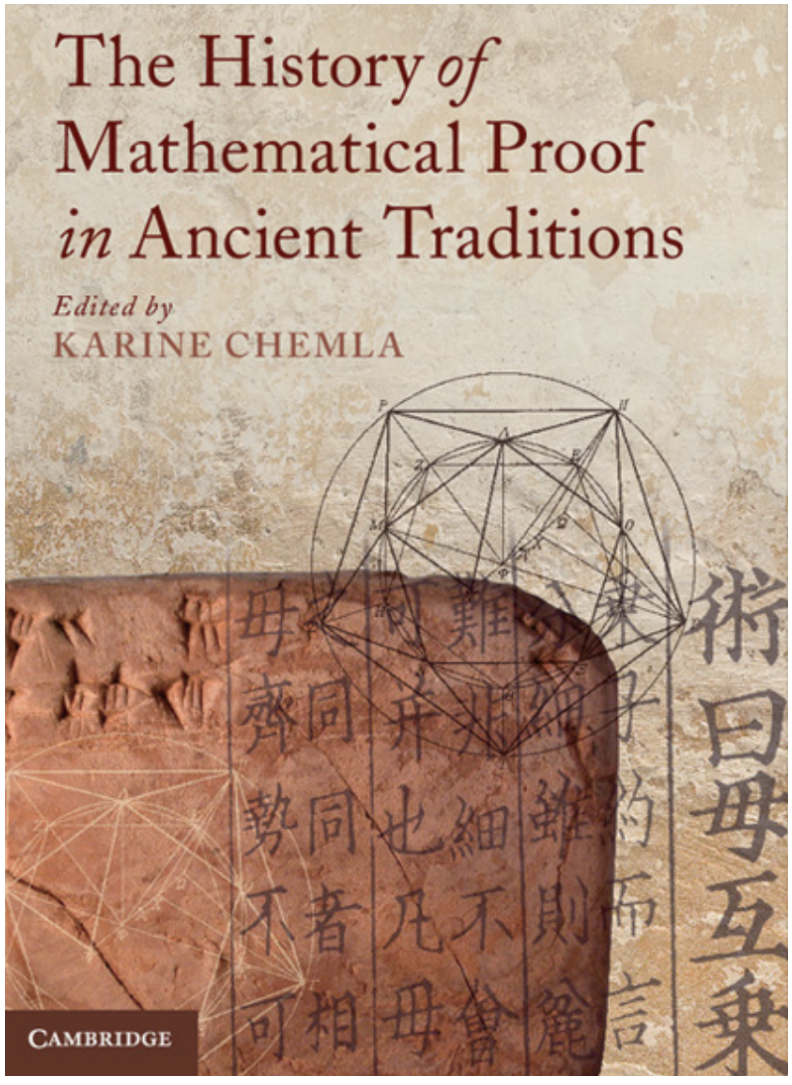
♦ **[Workshop] Arithmetic, algebra, and their relation to geometry**
A global/inclusive approach

- Date: August 21-25, 2023
- Place: KIAS 8101
- Speakers:
  - Jessica Carter (Aarhus University)
  - João Cortese (University of São Paulo)
  - Lee Eunsoo (Seoul National University)
  - Veronica Gavagna (Università degli Studi di Firenze)
  - Emmylou Haffner (ENS-PSL)
  - Michael Harris (Columbia University)
  - Antoni Malet (Institut d'Història de la Ciència (UAB)/Laboratoire SPHERE (UMR 7219, CNRS-Université Paris Cité))
  - Nicolas Michel (Wuppertal Universität)
  - David Mumford (Brown University)
  - Reviel Netz (Stanford University)
  - Young-sook Oh (Independant Scholar)
  - Shuwuan Pan (Institute for History of Natural Sciences, Chinese Academy of Sciences)

vents.kias.re.kr/h/HCMCTP23/?pageNo=5093

Figure: Workshop at the Korea Institute for Advanced Study, August, 2023

Books

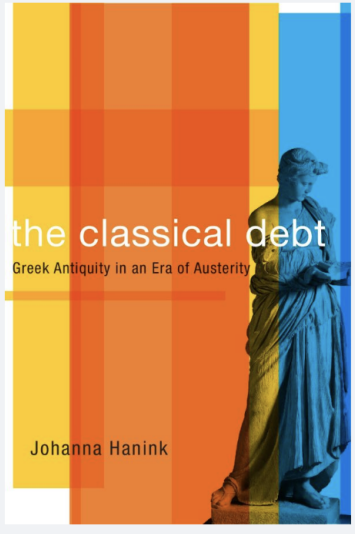


The standard history of mathematical proof in ancient traditions at the present day is disturbingly simple.

Books

Harvard University Press

Books Features Resources About Index



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Johanna Hanink

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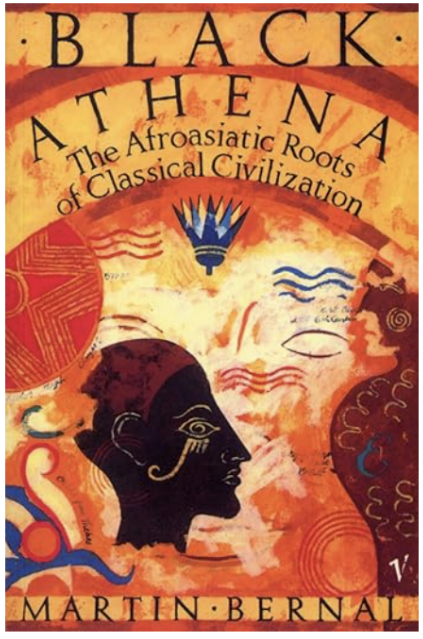

Roll over image to zoom in

Read sample

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Black Athena: The Afroasiatic Roots of Classical Civilization Volume One:The Fabrication of Ancient Greece 1785-1985 Paperback – 21 Nov. 1991

by Martin Bernal (Author)

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Classical civilisation, Martin Bernal argues, has deep roots in Afro-Asiatic cultures. But these Afro-Asiatic influences have been systematically ignored, denied, or suppressed since the eighteenth century - chiefly for racist reasons.

The popular view is that Greek civilisation was the result of the conquest of a sophisticated but weak native population by vigorous Indo-European speakers--or Aryans--from the North. But the Classical Greeks, Bernal argues, knew nothing of this "Aryan model." They did not see their political institutions, science, philosophy, or religion as original, but rather as derived from the East in general, and Egypt in particular.