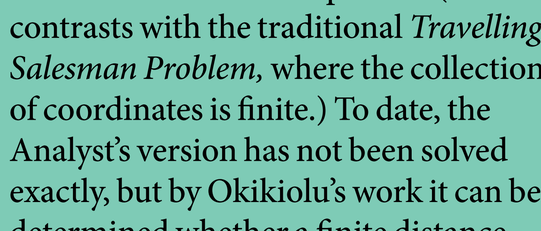
Mathematicians
A–Z

Okikiolu
Peet
Quinn
Robinson

UNIVERSITY OF OXFORD
Mathematical Institute

Kate Okikiolu
(England, b. 1965)

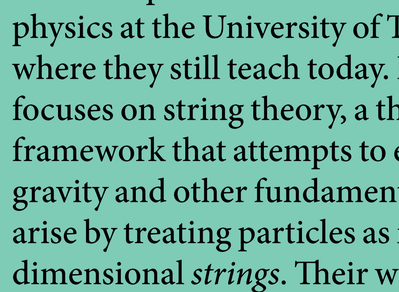
Kate Okikiolu is a British mathematician known for her work in geometry and analysis. In 1992, she made a significant breakthrough on the *Analyst's Travelling Salesman Problem*, where a salesperson is given an infinite collection of coordinates to visit and must determine their shortest round-trip route. (This contrasts with the traditional *Travelling Salesman Problem,* where the collection of coordinates is finite.) To date, the Analyst's version has not been solved exactly, but by Okikiolu's work it can be determined whether a finite distance journey *exists* passing through all the coordinates – and computes the minimal distance within a certain error. In 1997, Okikiolu became the first black recipient of a Sloan Research Fellowship. In the same year, she was awarded a Presidential Early Career Award in recognition of her research, as well as her development of constructive mathematics and science curricula for young inner-city children. In 2001, Okikiolu became the first black woman to publish in the *Annals of Mathematics* (one of the most prestigious modern mathematics journals).



The *Analyst's Travelling Salesman Problem* was solved for infinite $S \subseteq \mathbb{R}^2$ by Peter Jones (American mathematician, b. 1952). The solution is computed by subdividing $\mathbb{R}^2$ into smaller and smaller boxes, then measuring how close S is to a straight line in each box. Okikiolu proved his result in higher dimensions by developing further geometric techniques. Above is the *Koch curve*; a fractal whose points cannot be visited in a finite distance journey.

A.W. Peet
(New Zealand, b. c. 1965)

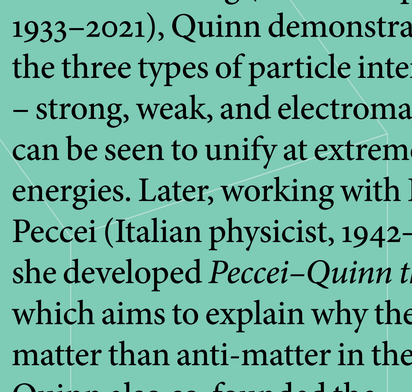
Born and raised in New Zealand, A.W. Peet pursued undergraduate studies at the University of Canterbury, where they graduated with an honours degree in physics in 1990. After moving to the United States to complete their PhD at Stanford, and postdoctoral positions at Princeton and UC Santa Barbara, they became a professor of theoretical physics at the University of Toronto, where they still teach today. Peet's work focuses on string theory, a theoretical framework that attempts to explain how gravity and other fundamental forces arise by treating particles as multi-dimensional *strings*. Their work investigates how quantum effects exhibited by black holes can be used as a "theoretical laboratory" to help us understand gravity. Alongside their research, Peet has done substantial outreach work for both science and equality, diversity, and inclusion initiatives. In 2002, they were awarded a Sloan Research Fellowship in Physics, and in 2016 they were recognised by the University of Toronto Arts and Science Students' Union for their achievements in promoting diversity and equity issues at the University of Toronto.



Above: the central black hole of Messier 87, captured by the Event Horizon Telescope Collaboration.

Helen Quinn
(Australia, b. 1943)

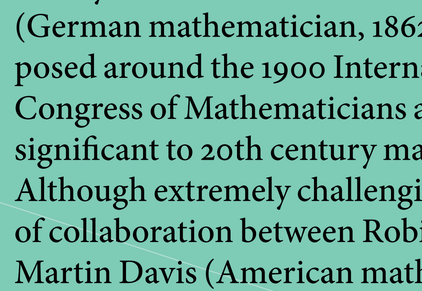
Born and raised in Australia, Helen Quinn has spent much of her career within the United States, beginning with her PhD studies at Stanford University. Together with Howard Georgi (American physicist, b. 1947) and Steven Weinberg (American physicist, 1933–2021), Quinn demonstrated how the three types of particle interactions – strong, weak, and electromagnetic – can be seen to unify at extremely high energies. Later, working with Roberto Peccei (Italian physicist, 1942–2020), she developed *Peccei–Quinn theory*, which aims to explain why there is more matter than anti-matter in the universe. Quinn also co-founded the *Contemporary Physics Education Project* and spearheaded the production of 'A Framework for K-12 Science Education', which led to a new set of science education standards adopted by many American states. Quinn has received many prestigious awards throughout her distinguished career, including the Dirac Medal, the Order of Australia, and the Benjamin Franklin Medal.



An example collision of two protons in the CMS detector at CERN. In this simulation, a Higgs boson is produced, which quickly decays into four muons.

Julia Robinson
(USA, 1919–1985)

Julia Robinson was an American mathematician who, after completing a PhD in logic and number theory at the University of California in 1948, began working on *Hilbert's Tenth Problem* (see inset). This problem was one of twenty-three that David Hilbert (German mathematician, 1862–1943) posed around the 1900 International Congress of Mathematicians as the most significant to 20th century mathematics. Although extremely challenging, years of collaboration between Robinson, Martin Davis (American mathematician, b. 1928), and Hilary Putnam (American mathematician, 1926–2016), with final input from Yuri Matiyasevich (Russian mathematician, b. 1947) yielded success in 1970 with the proof of a key result that resolved the problem with a negative answer. For her monumental achievement, Robinson became the first female mathematician to be elected to the US National Academy of Sciences, was subsequently offered a professorship at UC Berkeley, and in 1982 became the first female president of the American Mathematical Society.



Hilbert's Tenth Problem asks to determine whether there exists an algorithm which, if supplied a polynomial $f(x_1, \ldots, x_n)$ over $\mathbb{Z}$, outputs YES if $f(x_1, \ldots, x_n)=0$ has an integer solution, and NO otherwise. Davis, Putnam, Robinson and Matiyasevich showed *no such algorithm exists.* Pictured above (left to right) are Davis, Robinson & Matiyasevich, in Calgary in 1982.

Poster sources Okikiolu: Personal correspondence, Wikipedia, mathshistory.st-andrews.ac.uk, *Points on Computable Curves* by X. Gu et al. arXiv:cs/0512042 (2005), *Rectifiable Sets and the Travelling Salesman Problem* by P.W. Jones, Invent. Math. 102, pp. 1–15 (1990), Maryville University: Guide for Women in Mathematics. Peet: Wikipedia, ap.io, assu.ca/wp/services-resources/assu-awards, trinity.utoronto.ca, nationalgeographic.com. Quinn: Wikipedia, American Institute of Physics press release, the Franklin Institute Laureates page. Robinson: Wikipedia, Britannica, "Julia Bowman Robinson, 1919–1985", Biographical Memoirs. Vol. 63 (1994), by S. Feferman.

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