Sae Koyama

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RESEARCH INTERESTS

Algebraic geometry; logarithmic and tropical geometry; moduli spaces and enumerative invariants

EDUCATION

2024 –   **PhD in Mathematics**

Advisor: Dhruv Ranganathan

2022–24   **MMath (Part III), University of Cambridge**

Honours pass with Distinction.

2019–22   **BA in Mathematics, University of Cambridge**

First Class Honors.

PUBLICATIONS

2024: Constructions of superabundant tropical curves in higher genus

To appear in Bulletin of the LMS

AWARDS AND PRIZES

Benefactors Scholarship (2024): Awarded by St John's College to fund PhD.

Adams Memorial Prize and Ian Hall Year Prize (2022): Prize at St John's College, Cambridge to mark academic achievement within year group.

Baylis Scholarship (2024, 2022, 2021, 2020): For First Class achievement in examinations.

Leatham (Wright) Prize (2024, 2020): For excellent examination performance and progress.

Pythagoras Award (2019): Pre-admission prize in mathematics at St John's College.

EXPERIENCE

2024 Part III essay, Singular points on Hilbert schemes of points.

Supervised by Fatemeh Razaee. I wrote an expository piece on Hilbert schemes of points, including Jelisiejew's proof of Vakil's Murphy's Law, and Ramkumar–Sammartano's recent progress on Briancon–Iarrobino's conjecture regarding maximally singular points on Hilbert schemes of points.

I did a 30-minute presentation on my essay for the Part III seminar.

2022 Part III seminar

I gave a 30-minute presentation on Chip-Firing Configurations and its relation to divisors on algebraic curves.

2021, 2022, 2024 Counsellor at PROMYS Europe

Deputy Head Counsellor in 2022, Head Counsellor in 2024.

I worked in a team of nine counsellors to deliver an immersive mathematical environment for the participants (aged 16-18). I marked student work in number theory and group theory/graph theory and gave one-to-one feedback. In 2021, I participated in seminars for the counsellors on category theory and analytic number theory, as well as giving a talk on hyperbolic geometry aimed at the participants. In 2022, I participated in seminars on Galois theory, gave a one-off talk aimed at the counsellors on tropical geometry, and gave a talk aimed at the participants on enumerative geometry. In 2024, I participated in seminars on K-theory, and gave a talk on a tropical proof of Kontsevich's formula.

2021-2024 Reading groups

In third year, I participated in an algebraic geometry reading group, covering some chapters of Ravi Vakil's 'The Rising Sea: Foundations of Algebraic Geometry', and Amnon Neeman's 'Algebraic and Analytic Geometry'.

In fourth year, I organised a reading group on toric varieties, following William Fulton's 'Introduction to Toric Varieties' and a general algebraic geometry seminar for Part III students. I also participated in a reading group on intersection theory.

OTHER EXPERIENCE

- President of the Cambridge University Ethics in Maths Society, raising awareness of the impact of mathematics on society.
- Committee member of the Adams Society (the mathematical society of St John's college, Cambridge), which organises mathematical talks and social events.
- Completed eight computational projects as part of Cambridge course.