Daniel Kaplan

Contact and Personal Information

University of Hasselt
Department of Mathematics
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Born: August 21, 1990 in Santa Fe, New Mexico
Citizenship: United States and United Kingdom

Research Interests

Noncommutative algebras in geometry and mirror symmetry
Hochschild cohomology and deformation theory
Preprojective algebras and representation varieties

Employment

University of Hasselt: Postdoctoral Fellow with Michel Van den Bergh, 2022-present

University of Birmingham: Postdoctoral Fellow with Tyler Kelly, 2020-2022

Fields Institute: Postdoctoral Fellow, July-December 2019

Education

Imperial College London: Ph.D. in Mathematics with Travis Schedler, 2015-2019

University of Texas at Austin: M.A. in Mathematics, 2013-2015

Northwestern University: B.A. in Mathematics, 2009-2013

Articles

1. *Multiplicative preprojective algebras are 2-Calabi–Yau*
   joint with Travis Schedler, 48 pages, accepted to Algebra and Number Theory
2. *Multiplicative preprojective algebras of Dynkin quivers*, 20 pages
   Journal of Pure and Applied Algebra, Volume 227, Issue 1 (2023) 26 pp.
3. *A maximally-graded invertible cubic threefold that does not admit a full exceptional collection of line bundles* joint with David Favero and Tyler L. Kelly
   Forum of Mathematics, Sigma Volume 8, Edition 56 (2020) 1-8.
4. *Frobenius Degenerations of Preprojective Algebras*
   Journal of Noncommutative Geometry, Volume 14, Issue 1 (2020) 349-411.
5. *The Spectrum of the Laplacian on Regular Polyhedra*
   joint with Evan Greif, Robert S. Strichartz, and Samuel C. Wiese,
   Commun. Pure Appl. Anal. 20 (2021), no. 1, 193–214.

Preprints

6. *Exceptional Collections for Mirrors of Invertible Polynomials*
   joint with David Favero and Tyler L. Kelly, 14 pages, arXiv:2001.06500v2
7. *Multiplicative preprojective algebras with an eye towards multiplicative quiver varieties*, Oberwolfach Report, 5 pages.

Non-research Article

8. *An endless pursuit*
   joint with Michael Kaplan, Nature Physics Volume 19, Issue 3 (2023)
   A film review of Netflix's documentary "A Trip to Infinity"

Honors and Awards

Imperial College London: *Student Award for Outstanding Achievement*, 2018
A prize awarded to a single graduate student annually, among over 8000 total
Northwestern University
Outstanding Contributions to Undergraduate Mathematical Life, 2012, 2013
Northwestern Outstanding Achievement in Mathematics, 2011, 2012

Visitor

Isaac Newton Institute for Mathematical Sciences themed program
K-theory, algebraic cycles and motivic homotopy theory, Spring 2022
Hausdorff Institute for Mathematics' themed semester
Symplectic Geometry and Representation Theory, Fall 2017
Max Planck Institute for Mathematics
International Max Planck Research School for Moduli Spaces, August 2016

Selected Talks

INI Mathematical physics: algebraic cycles, strings, and amplitudes workshop
Multiplicative quiver varieties and resolutions of singularities, July 2022
Finite Dimensional Algebra (FD) Seminar:
Relating properties of homological dimension two algebras, June 2022
Glasgow Algebra Seminar:
Multiplicative McKay correspondence, June 2022
Antwerp Algebra Colloquium:
Multiplicative preprojective algebras of Dynkin quivers, May 2022
Uppsala University's Geometry and topology seminar:
DG algebras associated to plumbed cotangent bundles, March 2022
University of Birmingham Geometry and Mathematical Physics Lectures:
What does the Kronecker quiver know about projective space?, November 2021
Harvard's Interdisciplinary Science Seminar:
Representations of quivers and the Deligne-Simpson problem, July 2021
Paris Algebra Seminar:
Multiplicative preprojective algebras of Dynkin quivers, May 2021
Leicester Algebra and Geometry Open Online (LAGOON) Seminar:
Multiplicative preprojective algebras in geometry and topology, January 2021
Korean Institute for Advanced Study:
Exceptional collections for mirrors of invertible polynomials, December 2020
Yale Clusters and Geometry Seminar: *Applications of the strong free product property to multiplicative quiver varieties*, November 2020
Nottingham's Online Algebraic Geometry Seminar:
Exceptional collections for invertible polynomials using VGIT, October 2020
University of Birmingham Geometry and Mathematical Physics Seminar:
A primer on Calabi-Yau algebras, March 2020
University of Toronto's Geometric Representation Theory Seminar:
The Structure of Multiplicative Preprojective Algebras, November 2019
Perimeter Institute's Mathematical Physics Seminar:
The Diamond Lemma for Multiplicative Preprojective Algebras, November 2019
McGill University, Brent Pym's students' seminar:
An Algebraic Approach to Multiplicative Quiver Varieties, November 2019
University of Alberta's Geometry, Algebra, and Physics Seminar:
What do multiplicative preprojective algebras resolve?, October 2019
Columbia Symplectic Geometry, Gauge Theory, and Categorification Seminar:
Formality of Multiplicative Preprojective Algebras, October 2019
MAGIC (More Algebraic Geometry at Imperial College) seminar:
McKay correspondence and preprojective algebras, September 2019
Oxford Junior Geometry and Topology Seminar:
The Dimension of Multiplicative Preprojective Algebras, May 2019
Glasgow Algebra Seminar: *The Deligne-Simpson Problem and Multiplicative Preprojective Algebras*, February 2019
UCLA Algebra Seminar: *Calabi–Yau algebras*, November 2018
Symplectic Cut Seminar at Kings College:
Multiplicative Preprojective Algebras are 2-Calabi-Yau, November 2018
Legendrian Knots and Constructible Sheaves, November 2016
Representations of Finite-Dimensional Algebras at Bielefeld:

Two Perspectives on Decorated Preprojective Algebras, December 2017

Higgs Bundles: Algebraic and Differential Geometric Perspectives on the Isle of Wight: *Character Varieties and the Riemann Hilbert Correspondence*, April 2017

European Talbot on Topological Aspects of Quantum Field Theories in Winterberg: *Comparison of (0,1,2) and (1,2) Algebra-Valued TQFTs*, June 2016

Max Planck Institute Course: Derived Deformation Theory and Koszul Duality *Koszul Duality for Associative Algebras*, June 2016

Teaching Experience

Instructor: Topics in Algebra (Homological Algebra) Winter 2022
This course is for advanced final year undergraduate students at UHasselt. I designed the curriculum, lectured, typed-up notes, created problem sets, distributed solutions, recorded lectures, held office hours, and created supplementary videos and handouts.

Teaching Assistant:
Algebra III at Imperial College London (with some guest lecturing) Fall 2016
M408M: Multivariable Calculus at UT Austin, Fall 2014
M408L: Integral Calculus at UT Austin, Spring 2014
M408D: Accelerated Multivariable Calculus at UT Austin, Fall 2013

Courses and Workshops:
An Introduction to Teaching Methods in Higher Eduction, March 2016
Assessment and Feedback in Practice, March 2016
Mathematics Teachers' Circle of Austin participant, 2014-2015
Supervised Teaching in Mathematics, Fall 2013

Mentoring Undergraduates

Kings College Undergraduate Talk:
"Papa, Papa, can you multiply triples?", December 2018

The Undergraduate Research Opportunities Program at Imperial College London
Modular Representation Theory, Summer 2018
Categorical $\mathfrak{sl}_2$ Actions, Summer 2017

Directed Reading Program at UT Austin
Rational Homotopy Theory, Fall 2014
Formal Moduli Problems, Spring 2015

Creating and Organizing Seminars and Conferences

Co-organized the Floer Homology Bootcamp at the Fields Institute
part of the themed semester in Homological Mirror Symmetry, December 2019

Created and organized a Mirror Symmetry seminar
aimed at postdocs at the Fields Institute, Summer 2019

Created and organized the Representation Theory and Complex Geometry Seminar, Imperial College, Fall 2016

Created the DAG X seminar at UT Austin, Spring 2015

Organized the Student Geometry Seminar at UT Austin, 2014-2015

Created and organized the Rational Homotopy Theory Seminar, Fall 2014

Co-organized the Graduate Student Geometry and Topology Conference, April 2014

Co-organized the Sophex seminar (for first year graduate students), Fall 2013

Organized Northwestern's Undergraduate Math Society Seminar, 2010-2012

Outreach

Eastern Africa Algebra Research Group Workshop Speaker, July 2023 (upcoming)

Volunteer at Drayton Park Primary School's Math Club, 2018-2019, 2021-present
with Richard Thomas and Balázs Szentes, we have accumulated hundreds of problems designed to require the kids to think deeply and effectively

Volunteer at Imaginary exhibition in Hasselt

a non-profit focused on the communication of modern mathematics
through interactive programs and picture galleries

Volunteer at Maths Circle Toronto, December 2019
"Enhancing mathematical education in Toronto for bright high school students"

Volunteer at The Great Exhibition Road Festival, 2019
a celebration of curiosity, discovery and exploration for the general public

Volunteer at Imperial Late: Xmaths, 2018
an entertaining math-themed night for adults of all backgrounds
where our station made Platonic solid shaped chocolates

Teacher at London Maths Outreach, 2019
co-taught a course on the mathematics of elections, congressional seats,
and district lines for years 12-13

Volunteer with STEM Potential, 2018
a program aimed at college readiness for students in low-income families

Mentor at STEM Summer Camp for Teenage Girls in Abuja, August 2016
attended virtually and spoke about how I became interested in math
using my favorite problems and outlined various problem solving techniques

Tutor for youths in low-income families at GCSE Success, 2015
tutored black and Muslim students in math, science, and literature

Tutor at Huckleberry Youth Program, 2009-2013
a program aimed at getting would-be first generation students into college

References

Travis Schedler, Reader in Pure Mathematics, Imperial College London,
Department of Mathematics, t.schedler@imperial.ac.uk

Tyler Kelly, Reader in Geometry, University of Birmingham,
Department of Mathematics, t.kelly.1@bham.ac.uk

Michel Van den Bergh, Professor, University of Hasselt
Department of Mathematics, michel.vandenbergh@uhasselt.be