

Melody Chan

CONTACT INFORMATION

Brown University
Department of Mathematics
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Providence, RI 02912, USA

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RESEARCH INTERESTS

Combinatorial algebraic geometry: algebraic curves and their moduli, graph theory, and tropical geometry

POSITIONS HELD

Associate Professor, Brown University, 2020-
Manning Assistant Professor at Brown University, 2019-2020
Assistant professor at Brown University, 2015-2019
NSF Postdoctoral Fellow and Lecturer at Harvard University, 2012-2015.

EDUCATION

University of California, Berkeley, 2008-2012.
Thesis: *Tropical curves and metric graphs*
Advisor: Bernd Sturmfels
Princeton University, 2006-2008, M.A.
Advisor: Paul Seymour
Cambridge University, 2005-2006, Certificate of Advanced Study in Mathematics, with Merit
Yale University, 2001-2005, B.S. computer science and mathematics, summa cum laude.
The Juilliard School, 2000-2001.
Studies in violin with Itzhak Perlman, Dorothy DeLay

SUBMITTED ARTICLES

1. *Homology representations of compactified configurations on graphs applied to $\mathcal{M}_{2,n}$* , with C. Bibby, N. Gadish, and C. Yun. [arXiv:2109.03302](https://arxiv.org/abs/2109.03302)

PUBLISHED/IN PRESS

1. *On the top weight rational cohomology of \mathcal{A}_g* , with M. Brandt, J. Bruce, M. Melo, G. Moreland, and C. Wolfe, to appear in *Geometry and Topology*
2. *The S_n -equivariant top weight Euler characteristic of $\mathcal{M}_{g,n}$* , with C. Faber, S. Galatius, and S. Payne, to appear in *American J. Mathematics*
3. *Relative Richardson varieties*, with N. Pflueger, to appear in *Math. Proc. Cambridge Phil. Soc.*
4. *Moduli spaces: classical and tropical*, Notices of the American Mathematical Society, November 2021.
5. *Topology of moduli spaces of tropical curves with marked points*, with S. Galatius and S. Payne, Facets of Algebraic Geometry volume in honor of William Fulton, 77–131. London Mathematical Society Lecture Note Series, Vol. 472, Cambridge University Press, 2022.
6. *Combinatorial relations on skew Schur and skew stable Grothendieck polynomials*, with N. Pflueger, Algebraic Combinatorics 4 (1) (2021), 175–188.
7. *Tropical curves, graph complexes, and the top weight cohomology of \mathcal{M}_g* , with S. Galatius and S. Payne, J. Amer. Math. Soc. (2) (2021), 565–594.
8. *Euler characteristics of Brill-Noether varieties*, with N. Pflueger, Trans. Amer. Math. Soc. 374 (2021), 1513–1533.
9. *Topology of the tropical moduli spaces $\mathcal{M}_{2,n}$* , Beiträge zur Algebra und Geometrie, (2021), 1–25.

10. *A moduli stack of tropical curves*, with R. Cavalieri, M. Ulirsch, and J. Wise, *Forum of Mathematics*, Sigma 8 (2020), e23.
11. *The Gieseker-Petri theorem and imposed ramification*, with B. Osserman and N. Pflueger, *Bulletin of the London Mathematical Society* 51 (2019), no. 6, 945–960.
12. *Genera of Brill-Noether curves and staircase paths in Young tableaux*, with A. López Martin, N. Pflueger, M. Teixidor i Bigas, *Trans. Amer. Math. Soc.* 370 (2018), 3405–3439.
13. *Lectures on tropical curves and their moduli spaces*, in *Moduli of Curves*, Springer, New York, 2017.
14. *Theta characteristics of tropical K_4 -curves*, with P. Jiradilok, in *Combinatorial algebraic geometry* (eds G. G. Smith and B. Sturmfels), *Fields Institute Communications*, Springer, New York, vol 80 (2017).
15. *The expected jaggedness of order ideals*, with S. Haddadan, S. Hopkins, L. Moci, *Forum of Mathematics Sigma*, Vol. 5, e9 (2017), 27 pages.
16. *Sandpiles, spanning trees, and plane duality*, with D. Glass, M. Macauley, D. Perkinson, C. Werner, Q. Yang, *SIAM J. Discrete Math* 29-1 (2015), 461–471.
17. *Fano schemes of determinants and permanents*, with N. Ilten, *Algebra and Number Theory* 9-3 (2015), 629–679.
18. *Rotor-routing and spanning trees on planar graphs*, with T. Church and J. Grochow, *Int. Math. Res. Not.* 11 (2015), 3225–3244.
19. *Tropical Teichmüller and Siegel spaces*, with M. Melo and F. Viviani, *Algebraic and combinatorial aspects of tropical geometry*, 45–85, *Contemporary Mathematics* 589, AMS, Providence, RI, 2013.
20. *Tropical curves and metric graphs*, Ph.D. dissertation, U.C. Berkeley, 107 pages, 2012.
21. *Elliptic curves in honeycomb form*, with B. Sturmfels, *Algebraic and combinatorial aspects of tropical geometry*, 87–107, *Contemporary Mathematics* 589, AMS, Providence, RI, 2013.
22. *Tropical hyperelliptic curves*, *Journal of Algebraic Combinatorics* 37 (2013), no. 2, 331–359.
23. *Combinatorics of the tropical Torelli map*, *Algebra and Number Theory* 6 (2012), no. 6, 1133–1169.
24. *Three notions of tropical rank for symmetric matrices*, with D. Cartwright, *Combinatorica* 32 (2012), no. 1, 55–84.
25. *The 4×4 minors of a $5 \times n$ matrix are a tropical basis*, with A. N. Jensen and E. Rubei, *Linear Algebra and its Applications* 435 (2011), no. 7, 1598–1611.
26. *The distinguishing number of the augmented cube and hypercube powers*, *Discrete Mathematics* 308 (2008), no. 11, 2330–2336.
27. *Improved pebbling bounds*, with A. Godbole, *Discrete Mathematics* 308 (2008), no. 11, 2301–2306.
28. *The distinguishing number of the direct product and wreath product action*, *Journal of Algebraic Combinatorics* 24 (2006), no. 3, 331–345.
29. *The maximum distinguishing number of a group*, *Electronic Journal of Combinatorics* 13 (2006), no. 1, R70.
30. *Stably computable properties of network graphs*, with D. Angluin, J. Aspnes, M. J. Fischer, H. Jiang, R. Peralta, *Distributed Computing and Sensor Systems: First IEEE International Conference, DCOSS 2005, Marina del Rey, CA, USA, /, 2005, Proceedings, Lecture Notes in Computer Science*, volume 3560, Springer-Verlag, 2005, 63–74.

AWARDS

2022 Fellow of the American Mathematical Society

NSF Award #2053221 FRG: Collaborative Research: Matroids, Graphs, and Algebraic Geometry, 2021-2024, in collaboration with June Huh, Nicholas Proudfoot, and Sam Payne, \$427,722.

NSF grant #1844768 CAREER: Algebraic curves and their moduli: degenerations and combinatorics, 2019-2024, \$399,928.

AWM-Microsoft Research Prize in Algebra and Number Theory, 2020. Awarded every other year
Sloan Research Fellow, 2018.

Henry Merritt Wriston Fellowship, Brown University, 2017-2018, for excellence in teaching and research by junior faculty

NSF grant #1701924 “Algebraic and tropical moduli spaces and Brill-Noether theory,” 2017-2020, \$179,998.

NSA Young Investigators Grant, 2016-2017

SELECTED AWARDS BEFORE 2015

NSF Postdoctoral Fellowship, 2012-2015

NDSEG and NSF Graduate Fellowships, 2007-2012

Association of Women in Mathematics (AWM) Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman, 2005

Henry Fellowship for study at Cambridge University, 2005

Deforest Senior Prize, Benjamin F. Barge, George Beckwith, and Anthony J. Stanley Departmental Prizes, Yale Mathematics Department, 2002-2005

Hart Lyman Prize, awarded to one member of Yale’s junior class for “the best record of accomplishment intellectually and socially,” 2004

TEACHING AND ADVISING

Brown University:

1. Math 540 Honors linear algebra (undergraduate), Fall 2015
2. Math 1040 Fundamental problems of geometry (undergraduate), Spring 2016
3. Math 1530 Abstract algebra (undergraduate), Spring 2017
4. Math 2050 Algebraic geometry (graduate), Fall 2017
5. Math 750 Introduction to higher mathematics (undergraduate), Fall 2017
6. Math 2520 Algebra (graduate), Spring 2019
7. Math 760 Introduction to higher mathematics (undergraduate), Spring 2019
8. Math 2050 Algebraic geometry (graduate), Fall 2019
9. Math 750 Introduction to higher mathematics (undergraduate), Fall 2019
10. Math 2520 Algebra (graduate), Spring 2020
11. Math 2520 Algebra (graduate), Spring 2021
12. Math 540 Honors linear algebra (undergraduate), Summer 2021
13. Math 2720T Graphs, matroids, and moduli spaces (graduate), Spring 2022
14. Math 2710O Topics in combinatorics (graduate), Fall 2022

Harvard University:

1. Math 233 Theory of schemes (graduate), Fall 2012
2. Math 285 Tropical geometry (graduate), Spring 2013
3. Math M Introduction to functions and calculus (undergraduate), Fall 2013
4. Math 137 Algebraic geometry (undergraduate), Spring 2014

Derek Box Certificate for Excellence in teaching at Harvard University, based on student evaluations, awarded three times

Advising and mentoring:

Postdoctoral:

Madeline Brandt, NSF Postdoctoral Fellow and Tamarkin Assistant Professor, 2020-2024

Rohini Ramadas, NSF Postdoctoral Fellow and Tamarkin Assistant Professor, 2018-2022

Kathlén Kohn, ICERM postdoc, 2018-2019

Daoji Huang, ICERM postdoc, 2020

Graduate:

Shiyue Li, 2017-.

Claudia Yun, 2017-2022.

Siddarth Kannan, 2019-.

Stefano Serpente, 2021-.

Megan Chang-Lee, 2022-.

Undergraduate theses:

Claire Frechette, Brown University, 2016

Christopher Eur, Harvard University, 2015

Undergraduate research supervision:

Jeremy Wang, 2022

Pakawut Jiradilok, Harvard summer research, 2014

Thesis, exam committees:

PhD dissertation committee:

Dori Bejleri, Alicia Harper, Laura Walton, 2018;

Shamil Asgarli, Thomas Silverman, 2019

Terrence George, Giovanni Inchiostro, Xiang Raymond Li, 2020

Alex McDonough, 2021

Patrick Liscio, 2022

Topics exam/qualifying exam committee:

Veronica Arena, Tangli Ge, Sarah Griffith, Ching-Peng Huang, Mona Khoshnevis, Alex Mc-

Donough, Stephen Obinna, Ming Hao Quek, Thomas Silverman, Tom Stone, Max Weinreich,

Teressa Chambers

Undergraduate thesis committee:

Max Hlavacek, Jeremy Usatine

Other:

Teaching assistant, Moduli of Curves, IAS Program for Women and Mathematics, 2015

Teaching assistant, Math Research Communities, Tropical and Nonarchimedean Geometry, 2013

Teaching assistant, IMA Summer Program for Algebraic Geometry for Applications, 2012

Teaching assistant, MSRI Summer Graduate Workshop on Cluster Algebras, 2011

CONFERENCE,
WORKSHOP,
SEMINAR
CO-ORGANIZATION

1. AGNES Summer Schools, 2022 and 2023
2. AMS Special Session on Combinatorial Algebraic Geometry, Eastern Sectional Meeting, Fall 2022
3. Combinatorics and Nonlinear Algebra Day at Brown, 2022
4. ICERM Combinatorial Algebraic Geometry Semester, 2021
5. ICERM Introductory Workshop: Combinatorial Algebraic Geometry, 2021
6. ICERM Women in Algebraic Geometry Workshop, 2020
7. Algebraic and Tropical Meetings Online, 2020
8. Facets of Algebraic Geometry, *New Facets* for early career mathematicians, Michigan, 2019
9. AGNES, Brown University, 2018
10. Women@AGNES, Brown University, 2018
11. BIRS-Oaxaca workshop on algebraic, tropical, and nonarchimedean analytic geometry of moduli spaces, 2016
12. Women@AGNES, Yale University, 2016
13. AGNES, Brown University, 2015
14. BATMOBILE (Biannual Algebraic and Tropical Meetings Of Brown and Institutions Located nEarby), 2014-now
15. Harvard/MIT Algebraic Geometry Seminar, 2012-2014
16. AMS Special Session on tropical and nonarchimedean geometry, Joint Math Meetings, 2014
17. AMS Special Session on tropical geometry at the Joint Math Meetings, 2013
18. UC Berkeley Student Seminar in Discrete Mathematics, 2010-2011

SELECTED INVITED
AND DISTINGUISHED
LECTURES

1. AMS Eastern sectional meeting plenary, UMass Amherst, 2022

2. Spec \mathbb{Q} -bar plenary talk, Fields Institute, Toronto, 2022
3. Heilbronn Annual Conference, Bristol, 2019
4. Leonard C. Sulski Memorial Lecture, Holy Cross, 2019
5. Connecticut Valley Colloquium, Amherst, 2018
6. AWM Distinguished speaker series, Oregon, 2018
7. Mid-Atlantic Algebra, Geometry, and Combinatorics, Penn, 2017
8. Texas Algebraic Geometry Symposium, Rice University, 2017
9. Western Algebraic Geometry Symposium, UBC, 2017
10. Discrete Math Day of the Northeast, Smith, 2016
11. Algebra, Geometry and Combinatorics Day 11, DePaul, 2014
12. AGNES (Algebraic Geometry Northeastern Series), Brown, 2012

CONFERENCE TALKS

1. Combinatorial, Computational, and Applied Algebraic Geometry, University of Washington, 2022
2. Gustafsson Symposium, Institut Mittag-Leffler, Stockholm Sweden, 2022
3. Graph Complexes and Quantum Field Theory, Berlin/virtual, 2022
4. BIRS Cohomology of Arithmetic Groups: Duality, Stability, and Computations, 2021
5. ICERM workshop: Algebraic geometry and polyhedra, 2021
6. Moduli on Chestnut Hill workshop, Boston College, 2020
7. Northeastern Topology mini-conference, 2019
8. Graph complexes in algebraic geometry and topology, Manchester, 2019
9. Ideals, varieties, applications: celebrating the influence of David Cox, 2019
10. MSRI Workshop on recent progress on moduli theory, 2019
11. Ohio State workshop on Schubert calculus, 2018
12. Workshop on tropical varieties and amoebas in higher dimension, Stockholm, 2018
13. Simons Symposium on non-Archimedean and tropical geometry, 2017
14. Combinatorial moduli spaces workshop, Fields Institute, 2016
15. BIRS-CMO Workshop on sandpile groups, 2015
16. AIM Workshop on degenerations in algebraic geometry, 2015
17. AMS Summer Institute in Algebraic Geometry, 2015
18. UNC Chapel Hill Workshop on Moduli Spaces, Derived Geometry, and Geometric Representation Theory, 2014
19. Utah Tropical Geometry conference, 2014
20. BIRS Specialization of Linear Series for Algebraic and Tropical Curves, 2014
21. Joint Math Meetings AMS-AWM Special Session on Geometric Applications of Algebraic Combinatorics, 2014
22. SIAM Conference on Applied Algebraic Geometry, Special Session on Tropical Geometry and Combinatorics in Dynamical Systems, Colorado State, 2013
23. AMS Eastern sectional, Special Session on Moduli Spaces in Algebraic Geometry, Boston College, 2013
24. PhD Students Conference on Tropical Geometry, Göttingen, 2011
25. FPSAC 22 (Formal Power Series and Algebraic Combinatorics), 2010
26. SIAM Conference in Discrete Mathematics, Austin, 2010
27. Princeton-Oxford Combinatorics Workshop, 2008

LECTURE SERIES, MINICOURSES

1. EWM/EMS Summer school on tropical moduli, Institut Mittag Leffler, Stockholm/virtual, 2021
2. GAeL XXVI (Géométrie Algébrique en Liberté), 4 lectures, Strasbourg, 2018
3. MIT/Harvard Graduate Workshop in Algebraic Geometry, 1.5 lectures, 2018
4. CIMPA-CIMAT-ICTP School on Moduli of Curves, Guanajuato, 5 lectures, 2016

COLLOQUIA

1. Harvard Center for Mathematical Sciences and Applications, 2022
2. McMaster University, 2021
3. Warwick University, 2021
4. Brandeis/Harvard/MIT/Northeastern, 2021
5. Johns Hopkins, 2019

6. University of Michigan, 2018
7. University of California at Davis, 2015
8. University of Illinois Urbana-Champaign, 2014
9. Johns Hopkins, 2014
10. University of Tennessee, 2014
11. University of California Berkeley, 2014
12. Reed College, 2014

SEMINARS

1. Combinatorics seminar, MIT, 2022
2. COGENT online seminar (online seminar in and around the cohomology of groups), 2022
3. Columbia Algebraic geometry seminar, 2021
4. UC Davis Algebraic geometry seminar, 2021
5. Algebra, Geometry, and Combinatorics Online, 2020
6. Brown Algebraic geometry seminar, 2019
7. Brown Combinatorics seminar, 2019
8. Duke Algebraic geometry seminar, 2019
9. Kentucky Algebra seminar, 2019
10. Stony Brook Algebraic geometry seminar, 2018
11. Amherst Valley geometry seminar, 2018
12. MIT Combinatorics seminar, 2018
13. Harvard/MIT Algebraic geometry seminar, 2018
14. Wisconsin Algebraic geometry seminar, 2017
15. Brandeis Combinatorics seminar, 2017
16. Brown Discrete math seminar, 2017
17. Northeastern Geometry, algebra, singularities and combinatorics seminar, 2017
18. Combinatorial Algebraic Geometry seminar, Fields Institute, 2016
19. Topology in a discrete setting seminar, ICERM semester on topology in motion, 2016
20. Northwestern Geometry and Physics seminar, 2016
21. Brown University Discrete math seminar, 2016
22. IAS Women and Mathematics seminar, 2015
23. University of Georgia Algebraic geometry seminar, 2015
24. Michigan State Algebra seminar, 2015
25. University of Michigan Combinatorics seminar, 2015
26. Harvard/MIT Algebraic geometry seminar, 2015
27. Boston University Geometry and Physics Seminar, 2014
28. Valley Geometry Seminar at University of Massachusetts Amherst, 2014
29. Brown University Geometry and Topology seminar, 2014
30. Colorado State FRAGMENT Seminar, 2014
31. Caltech Algebraic Geometry Seminar, 2014
32. Georgia Tech Algebra Seminar, 2014
33. University of Washington Algebra and Algebraic Geometry Seminar, 2014
34. MIT Combinatorics Seminar, 2014
35. Boston College Number theory and Algebraic Geometry Seminar, 2014
36. Brandeis Everytopic Seminar, 2013
37. Tropical aspects in Geometry and Topology, Max Planck Institute, Bonn, 2013
38. MIT Combinatorics Seminar, 2013
39. Rice University Algebraic Geometry Seminar, 2013
40. Tufts Algebra and Geometry Seminar, 2013
41. Yale Algebraic and Tropical Geometry Seminar, 2013
42. Stanford University Topology Seminar, 2012
43. UC San Diego Algebraic Geometry Seminar, 2011
44. Philadelphia Combinatorics and Algebraic Geometry Seminar, 2011
45. Johns Hopkins Algebraic Geometry and Number Theory Seminar, 2011
46. UC Irvine Algebra Seminar, 2011
47. UC Berkeley Combinatorics Seminar, 2011
48. Freie Universität Berlin Discrete Geometry Seminar, 2011

49. University of Chicago Geometry/Topology Seminar, 2011
50. UC Berkeley Representation Theory, Geometry and Combinatorics Seminar, 2011
51. UC Berkeley Algebraic Geometry Seminar, 2011
52. University of Warwick Algebraic Geometry Seminar, 2011
53. University of Rome III Geometry Seminar, 2011
54. University of Pisa Seminar, 2011
55. University of Florence Algebraic Geometry Seminar, 2011
56. Georgia Institute of Technology Tropical Geometry Seminar, 2010
57. MIT Combinatorics Seminar, 2010
58. UC Davis Algebra and Discrete Mathematics Seminar, 2010
59. UC Berkeley Seminar on Applications of Tropical Algebra, 2009
60. UC Berkeley Combinatorics Seminar, 2008
61. UC Davis Algebra and Discrete Mathematics Seminar, 2008

UNDERGRADUATE
AND OUTREACH
TALKS

1. Advanced seminar at PROMYS: *Graphs, matroids, and polynomiality*, 2022
2. Colloquium for EDGE: Enhancing Diversity in Graduate Education, 2020
3. Brown Math DUG seminar, 2019
4. Kentucky undergraduate seminar, 2019
5. Yale Intersections seminar, 2019
6. Oregon undergraduate seminar, 2018
7. Wesleyan Summer Science Series, 2018
8. Harvard Women in Math and Statistics, 2018
9. Johns Hopkins CTY Science and technology series at Brown, 2018
10. Girls' angle, for middle and high school girls, 2018
11. Harvard Open neighborhood seminar, 2018
12. Brown University Women in Science and Engineering (faculty panelist), 2017
13. Yale SUMRY undergraduate colloquium, 2017
14. Brown University Women's Intellectual Network Research Symposium (faculty panelist), 2017
15. Brown University SUMS undergraduate symposium, 2016
16. Harvard Women in Mathematics and Statistics (faculty panelist), 2016
17. Boston University PROMYS for high school students, 2015
18. Smith College Center for Women in Mathematics, 2015

SERVICE

Departmental service: diversity committee 2015-2016, graduate admissions committee, 2016-2017, 2018-2019 and 2021-2022, undergraduate committee 2018-2019, search committees, 2019-2020, 2020-2021

NSF panel member, 2018, 2020, 2021, 2022

Advisory board member, Cambridge Mathematical Textbooks series, 2021-.

Co-organizer, Horizons Seminar at Brown, featuring talks and workshops on topics that go beyond typical department seminars, including diversity, community, and career development for young mathematicians. 2016-2018.

Co-organizer, Mentoring Network for undergraduate/graduate women in math at Brown, 2016-2018

Co-organizer, first-year graduate student mentoring at UC Berkeley, 2010-2012

UC Berkeley Unbounded Representation, a graduate student group promoting dialogue on diversity in mathematics, 2010-2012

UC Berkeley Noetherian Ring, a graduate student group for women in mathematics, 2010-2012

Reviewer (with multiplicity) for: Adv. Geometry, Adv. Math, Birkhauser, Algebra Number Theory, Collectanea, Combinatorial Theory, Discrete Appl. Math, Discrete Math. Theor. Comput. Sci., Electronic Journal of Combinatorics, Forum of Math. Sigma, Int. J. Comput. Math, J. Algebraic Combin, JCTA, J. Graph Theory, J. Symbolic Computation, Linear and Multilinear algebra, Math. Annalen, Proc. Amer. Math. Soc., SIAM J. Discrete Math., Springer GTM, Trans. Amer. Math. Soc.

Professional membership: AMS