

# Melody Chan

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## CONTACT INFORMATION

Brown University  
Department of Mathematics  
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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](#)
2. *On the top weight rational cohomology of  $\mathcal{A}_g$* , with M. Brandt, J. Bruce, M. Melo, G. Moreland, and C. Wolfe. [arXiv:2012.02892](#)
3. *The  $S_n$ -equivariant top weight Euler characteristic of  $\mathcal{M}_{g,n}$* , with C. Faber, S. Galatius, and S. Payne, [arXiv:1904.06367](#)
4. *Relative Richardson varieties*, with N. Pflueger. [arXiv:1909.12414](#)

## PUBLISHED/IN PRESS

1. *Moduli spaces: classical and tropical*, Notices of the American Mathematical Society, November 2021.
2. *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, to appear.
3. *Combinatorial relations on skew Schur and skew stable Grothendieck polynomials*, with N. Pflueger, Algebraic Combinatorics 4 (1) (2021), 175–188.
4. *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.
5. *Euler characteristics of Brill-Noether varieties*, with N. Pflueger, Trans. Amer. Math. Soc. 374 (2021), 1513–1533.
6. *Topology of the tropical moduli spaces  $\mathcal{M}_{2,n}$* , Beiträge zur Algebra und Geometrie, (2021), 1–25.

7. *A moduli stack of tropical curves*, with R. Cavalieri, M. Ulirsch, and J. Wise, *Forum of Mathematics*, Sigma 8 (2020), e23.
8. *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.
9. *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.
10. *Lectures on tropical curves and their moduli spaces*, in *Moduli of Curves*, Springer, New York, 2017.
11. *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).
12. *The expected jaggedness of order ideals*, with S. Haddadan, S. Hopkins, L. Moci, *Forum of Mathematics Sigma*, Vol. 5, e9 (2017), 27 pages.
13. *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.
14. *Fano schemes of determinants and permanents*, with N. Ilten, *Algebra and Number Theory* 9-3 (2015), 629–679.
15. *Rotor-routing and spanning trees on planar graphs*, with T. Church and J. Grochow, *Int. Math. Res. Not.* 11 (2015), 3225–3244.
16. *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.
17. *Tropical curves and metric graphs*, Ph.D. dissertation, U.C. Berkeley, 107 pages, 2012.
18. *Elliptic curves in honeycomb form*, with B. Sturmfels, *Algebraic and combinatorial aspects of tropical geometry*, 87–107, *Contemporary Mathematics* 589, AMS, Providence, RI, 2013.
19. *Tropical hyperelliptic curves*, *Journal of Algebraic Combinatorics* 37 (2013), no. 2, 331–359.
20. *Combinatorics of the tropical Torelli map*, *Algebra and Number Theory* 6 (2012), no. 6, 1133–1169.
21. *Three notions of tropical rank for symmetric matrices*, with D. Cartwright, *Combinatorica* 32 (2012), no. 1, 55–84.
22. *The  $4 \times 4$  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.
23. *The distinguishing number of the augmented cube and hypercube powers*, *Discrete Mathematics* 308 (2008), no. 11, 2330–2336.
24. *Improved pebbling bounds*, with A. Godbole, *Discrete Mathematics* 308 (2008), no. 11, 2301–2306.
25. *The distinguishing number of the direct product and wreath product action*, *Journal of Algebraic Combinatorics* 24 (2006), no. 3, 331–345.
26. *The maximum distinguishing number of a group*, *Electronic Journal of Combinatorics* 13 (2006), no. 1, R70.
27. *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

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-.  
Siddarth Kannan, 2019-.

Undergraduate theses:

Claire Frechette, Brown University, 2016  
Christopher Eur, Harvard University, 2015

Undergraduate research supervision:

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

Topics exam/qualifying exam committee:

Tangli Ge, Sarah Griffith, Ching-Peng Huang, Mona Khoshnevis, Alex McDonough, Stephen Obinna, Ming Hao Quek, Thomas Silverman, Tom Stone, Max Weinreich, Teresa 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. ICERM Combinatorial Algebraic Geometry Semester, 2021
2. ICERM Introductory Workshop: Combinatorial Algebraic Geometry, 2021
3. ICERM Women in Algebraic Geometry Workshop, 2020
4. Algebraic and Tropical Meetings Online, 2020
5. Facets of Algebraic Geometry, *New Facets* for early career mathematicians, Michigan, 2019
6. AGNES, Brown University, 2018
7. Women@AGNES, Brown University, 2018
8. BIRS-Oaxaca workshop on algebraic, tropical, and nonarchimedean analytic geometry of moduli spaces, 2016
9. Women@AGNES, Yale University, 2016
10. AGNES, Brown University, 2015
11. BATMOBYLE (Biannual Algebraic and Tropical Meetings Of Brown and YaLE), 2014-now
12. Harvard/MIT Algebraic Geometry Seminar, 2012-2014
13. AMS Special Session on tropical and nonarchimedean geometry, Joint Math Meetings, 2014
14. AMS Special Session on tropical geometry at the Joint Math Meetings, 2013
15. UC Berkeley Student Seminar in Discrete Mathematics, 2010-2011

SELECTED INVITED  
AND DISTINGUISHED  
LECTURES

1. AMS Eastern sectional meeting plenary, UMass Amherst, 2022
2. Heilbronn Annual Conference, Bristol, 2019
3. Leonard C. Sulski Memorial Lecture, Holy Cross, 2019
4. Connecticut Valley Colloquium, Amherst, 2018
5. AWM Distinguished speaker series, Oregon, 2018
6. Mid-Atlantic Algebra, Geometry, and Combinatorics, Penn, 2017
7. Texas Algebraic Geometry Symposium, Rice University, 2017
8. Western Algebraic Geometry Symposium, UBC, 2017
9. Discrete Math Day of the Northeast, Smith, 2016
10. Algebra, Geometry and Combinatorics Day 11, DePaul, 2014
11. AGNES (Algebraic Geometry Northeastern Series), Brown, 2012

- CONFERENCE TALKS
1. BIRS Cohomology of Arithmetic Groups: Duality, Stability, and Computations, 2021
  2. ICERM workshop: Algebraic geometry and polyhedra, 2021
  3. Moduli on Chestnut Hill workshop, Boston College, 2020
  4. Northeastern Topology mini-conference, 2019
  5. Graph complexes in algebraic geometry and topology, Manchester, 2019
  6. Ideals, varieties, applications: celebrating the influence of David Cox, 2019
  7. MSRI Workshop on recent progress on moduli theory, 2019
  8. Ohio State workshop on Schubert calculus, 2018
  9. Workshop on tropical varieties and amoebas in higher dimension, Stockholm, 2018
  10. Simons Symposium on non-Archimedean and tropical geometry, 2017
  11. Combinatorial moduli spaces workshop, Fields Institute, 2016
  12. BIRS-CMO Workshop on sandpile groups, 2015
  13. AIM Workshop on degenerations in algebraic geometry, 2015
  14. AMS Summer Institute in Algebraic Geometry, 2015
  15. UNC Chapel Hill Workshop on Moduli Spaces, Derived Geometry, and Geometric Representation Theory, 2014
  16. Utah Tropical Geometry conference, 2014
  17. BIRS Specialization of Linear Series for Algebraic and Tropical Curves, 2014
  18. Joint Math Meetings AMS-AWM Special Session on Geometric Applications of Algebraic Combinatorics, 2014
  19. SIAM Conference on Applied Algebraic Geometry, Special Session on Tropical Geometry and Combinatorics in Dynamical Systems, Colorado State, 2013
  20. AMS Eastern sectional, Special Session on Moduli Spaces in Algebraic Geometry, Boston College, 2013
  21. PhD Students Conference on Tropical Geometry, Göttingen, 2011
  22. FPSAC 22 (Formal Power Series and Algebraic Combinatorics), 2010
  23. SIAM Conference in Discrete Mathematics, Austin, 2010
  24. 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. McMaster University, 2021
  2. Warwick University, 2021
  3. Brandeis/Harvard/MIT/Northeastern, 2021
  4. Johns Hopkins, 2019
  5. University of Michigan, 2018
  6. University of California at Davis, 2015
  7. University of Illinois Urbana-Champaign, 2014
  8. Johns Hopkins, 2014
  9. University of Tennessee, 2014
  10. University of California Berkeley, 2014
  11. Reed College, 2014
- SEMINARS
1. Columbia Algebraic geometry seminar, 2021
  2. UC Davis Algebraic geometry seminar, 2021
  3. Algebra, Geometry, and Combinatorics Online, 2020
  4. Brown Algebraic geometry seminar, 2019
  5. Brown Combinatorics seminar, 2019
  6. Duke Algebraic geometry seminar, 2019
  7. Kentucky Algebra seminar, 2019
  8. Stony Brook Algebraic geometry seminar, 2018

9. Amherst Valley geometry seminar, 2018
10. MIT Combinatorics seminar, 2018
11. Harvard/MIT Algebraic geometry seminar, 2018
12. Wisconsin Algebraic geometry seminar, 2017
13. Brandeis Combinatorics seminar, 2017
14. Brown Discrete math seminar, 2017
15. Northeastern Geometry, algebra, singularities and combinatorics seminar, 2017
16. Combinatorial Algebraic Geometry seminar, Fields Institute, 2016
17. Topology in a discrete setting seminar, ICERM semester on topology in motion, 2016
18. Northwestern Geometry and Physics seminar, 2016
19. Brown University Discrete math seminar, 2016
20. IAS Women and Mathematics seminar, 2015
21. University of Georgia Algebraic geometry seminar, 2015
22. Michigan State Algebra seminar, 2015
23. University of Michigan Combinatorics seminar, 2015
24. Harvard/MIT Algebraic geometry seminar, 2015
25. Boston University Geometry and Physics Seminar, 2014
26. Valley Geometry Seminar at University of Massachusetts Amherst, 2014
27. Brown University Geometry and Topology seminar, 2014
28. Colorado State FRAGMENT Seminar, 2014
29. Caltech Algebraic Geometry Seminar, 2014
30. Georgia Tech Algebra Seminar, 2014
31. University of Washington Algebra and Algebraic Geometry Seminar, 2014
32. MIT Combinatorics Seminar, 2014
33. Boston College Number theory and Algebraic Geometry Seminar, 2014
34. Brandeis Everytopic Seminar, 2013
35. Tropical aspects in Geometry and Topology, Max Planck Institute, Bonn, 2013
36. MIT Combinatorics Seminar, 2013
37. Rice University Algebraic Geometry Seminar, 2013
38. Tufts Algebra and Geometry Seminar, 2013
39. Yale Algebraic and Tropical Geometry Seminar, 2013
40. Stanford University Topology Seminar, 2012
41. UC San Diego Algebraic Geometry Seminar, 2011
42. Philadelphia Combinatorics and Algebraic Geometry Seminar, 2011
43. Johns Hopkins Algebraic Geometry and Number Theory Seminar, 2011
44. UC Irvine Algebra Seminar, 2011
45. UC Berkeley Combinatorics Seminar, 2011
46. Freie Universität Berlin Discrete Geometry Seminar, 2011
47. University of Chicago Geometry/Topology Seminar, 2011
48. UC Berkeley Representation Theory, Geometry and Combinatorics Seminar, 2011
49. UC Berkeley Algebraic Geometry Seminar, 2011
50. University of Warwick Algebraic Geometry Seminar, 2011
51. University of Rome III Geometry Seminar, 2011
52. University of Pisa Seminar, 2011
53. University of Florence Algebraic Geometry Seminar, 2011
54. Georgia Institute of Technology Tropical Geometry Seminar, 2010
55. MIT Combinatorics Seminar, 2010
56. UC Davis Algebra and Discrete Mathematics Seminar, 2010
57. UC Berkeley Seminar on Applications of Tropical Algebra, 2009
58. UC Berkeley Combinatorics Seminar, 2008
59. UC Davis Algebra and Discrete Mathematics Seminar, 2008

UNDERGRADUATE  
AND OUTREACH  
TALKS

1. Colloquium for EDGE: Enhancing Diversity in Graduate Education, 2020
2. Brown Math DUG seminar, 2019
3. Kentucky undergraduate seminar, 2019
4. Yale Intersections seminar, 2019

5. Oregon undergraduate seminar, 2018
6. Wesleyan Summer Science Series, 2018
7. Harvard Women in Math and Statistics, 2018
8. Johns Hopkins CTY Science and technology series at Brown, 2018
9. Girls' angle, for middle and high school girls, 2018
10. Harvard Open neighborhood seminar, 2018
11. Brown University Women in Science and Engineering (faculty panelist), 2017
12. Yale SUMRY undergraduate colloquium, 2017
13. Brown University Women's Intellectual Network Research Symposium (faculty panelist), 2017
14. Brown University SUMS undergraduate symposium, 2016
15. Harvard Women in Mathematics and Statistics (faculty panelist), 2016
16. Boston University PROMYS for high school students, 2015
17. 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, Collectanea, Discrete Appl. Math, Discrete Math. Theor. Comput. Sci., Electronic Journal of Combinatorics, 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, AWM