Patricia Klein – CV

Assistant Professor
Department of Mathematics
Texas A&M University

Email: pjklein@tamu.edu

Employment

Texas A&M University, Department of Mathematics

(2022-present) Assistant Professor

University of Minnesota, School of Mathematics

(2019-2022) Dunham Jackson Assistant Professor

Mentor: Christine Berkesch

University of Kentucky, Department of Mathematics

(2018-2019) University Research Postdoctoral Fellow

Mentor: Uwe Nagel

Education

University of Michigan, Department of Mathematics

(2018) Ph.D., Pure Mathematics

Advisor: Melvin Hochster

North Carolina State University, Department of Mathematics

(2012) Postbaccalaureate program

Williams College

(2011) B.A. (Cum Laude), Mathematics and Philosophy, Concentration in Cognitive Science (Honors)

Grants and Awards

15. NSF Standard Grant DMS-2246962, $165,000 (2023-2026).
14. Simons Foundation Travel Support for Mathematicians, $42,000 (2023-2028).
13. AWM Travel Grant, $3,500 (2023, declined for NSF DMS-2246962).
12. NSF Conference Grant DMS-2332592: Gender Equity in the Mathematical Study (GEMS) of Commutative Algebra, $20,000 (2023).
11. Faculty Driven Award, Institute for Diversity, Equity, and Advocacy, University of Minnesota, $3,650 (2021).
10. AIM SQuaRE: Rings of differential operators over toric face rings (2021).
9. AMS–Simons Travel Grant, $5,000 (2020).
8. NSF Conference Grant DMS-1908799: Graduate Workshop in Commutative Algebra for Underrepresented Minorities, $15,000 (with J. Bruce and C. Berkesch, 2019).
7. AWM–NSF Travel Grant, $2,155 (2018).
6. Pat Shure Excellence in Teaching Award, University of Michigan (2018).
5. AMS Student Travel Grant, $250 (2018).
4. Graduate Ambassadorship, Women and Mathematics Program at the Institute for Advanced Study, $1,000, (with A. Burcroff, A. Huszar, and T. Khain, 2017).
3. Diversity, Equity, and Inclusion Innovation Grant, University of Michigan, $2,590 (2017).
2. Rackham Faculty Allies for Diversity Grant, University of Michigan, $12,000 (with K. Smith, 2017).
1. Morgan Prize in Mathematics (for excellence in teaching), Williams College (2011).

Papers and preprints

† indicates undergraduate mentee.

11. On basic double links of squarefree monomial ideals (with M. Koban† and J. Rajchgot). Submitted, 14 pages, `arXiv:2209.00119`.

10. Differential operators, retracts, and toric face rings (with C. Berkesch, C-Y. J. Chan., J. Page, L.F. Matusevich, and J. Vassilev). Accepted to *Algebra & Number Theory*, 23 pages, `arXiv:2112.00266`.

9. Bumpless pipe dreams encode Gröbner geometry of Schubert polynomials (with A. Weigandt). Submitted, 50 pages, `arXiv:2108.08370`.

8. An illustrated view of the ring of differential operators of a reduced quotient of an affine semigroup ring (with C. Berkesch, C-Y. J. Chan., J. Page, L.F. Matusevich, and J. Vassilev), 2021. In: Miller, C., Striuli, J., Witt, E.E. (eds) *Women in Commutative Algebra.* Association for Women in Mathematics Series, vol 29. Springer, Cham, 49–94.

7. Homological and combinatorial aspects of virtually Cohen–Macaulay sheaves (with C. Berkesch, M. C. Loper, and J. Yang). *Transactions of the London Mathematical Society*, **8** (2021) no. 1, 413–434.

6. Diagonal degenerations of matrix Schubert varieties. *Algebraic Combinatorics*, **6** (2023) no. 4, 1073–1094.

5. Geometric vertex decomposition and liaison (with J. Rajchgot). *Forum of Mathematics, Sigma*, **9** (2021), e70.

4. Toric double determinantal varieties (with A. Blose†, O. McGrath†, and J. Morris†). *Communications in Algebra* **49** (2021), no. 7, 3085–3093.

3. Gröbner bases and the Cohen-Macaulay property of Li's double determinantal varieties (with N. Fieldsteel). *Proceedings of the AMS, Series B*, **7** (2020), 142–158.

2. Characterizing finite length local cohomology in terms of bounds on Koszul homology. *Journal of Algebra* **543** (2020), 198–224.

1. Lech's inequality, the Stückrad–Vogel conjecture, and uniform behavior of Koszul homology (with L. Ma, P.H. Quý, I. Smirnov, and Y. Yao). *Advances in Mathematics* **347** (2019), 442–472.

Other mathematical writings

4. Bumpless pipe dreams encode Gröbner geometry of Schubert polynomials (with A. Weigandt). FPSAC extended abstract (2022), accepted as talk.

3. Geometric vertex decomposition and liaison (J. Rajchgot). FPSAC extended abstract (2021), accepted as poster.

2. Combinatorial aspects of virtually Cohen–Macaulay sheaves (C. Berkesch, M.C. Loper, and J. Yang). FPSAC extended abstract (2021), accepted as poster.

1. Relationships among Hilbert-Samuel multiplicities, Koszul cohomology, and local cohomology. Thesis, University of Michigan (2018).

Publications in cognitive psychology

2. N. Kornell, P. Klein, and K. Rawson. *Retrieval attempts enhance learning, but retrieval success (versus failure) does not matter*, Journal of Experimental Psychology: Learning, Memory, and Cognition, 41(1):283 (2015).

1. N. Kornell, V. Rabelo, and P. Klein. *Tests enhance learning – compared to what?*, Journal of Applied Research in Memory and Cognition, 1:259 (2012).

Research Presentations

Note: $\star$ indicates that a talk was canceled due to COVID-19.

Seminar and Colloquium Talks

33. Algebraic and Enumerative Combinatorics Seminar, Waterloo University (Aug. 2023).

32. Algebra and Combinatorics Seminar, Texas A&M University (Apr. 2023).

31. Combinatorics Seminar, MIT-Harvard University (Sept. 2022).

30. Combinatorics Seminar, North Dakota State University (Apr. 2022).

29. Schubert Seminar, Online (Apr. 2022).

28. Number Theory and Algebraic Geometry Seminar, Simon Fraser University (Apr. 2022).

27. Combinatorics Seminar, University of Minnesota (Feb. 2022).

26. Algebra Seminar, University of Leeds (Feb. 2022).

25. Colloquium, Texas A&M University (Jan. 2022).

24. Colloquium, Oklahoma State University (Jan. 2022).

23. Commutative Algebra Seminar, Syracuse University (Dec. 2021).

22. Colloquium, University of Waterloo (Dec. 2021).

21. Colloquium, University of Florida (Nov. 2021).

20. Fellowship of the Ring (Nov. 2021).

19. Combinatorics and Geometry Seminar, University of Washington (Oct. 2021).

18. Colloquium, University of Idaho (Oct. 2021).

17. Commutative and Homological Algebra Market Presentations (Sept. 2021).

16. Séminaire du LaCIM (May 2021).

15. Commutative Algebra Seminar, University of Illinois at Chicago (Apr. 2021).

14. Combinatorics Seminar, University of Michigan (Dec. 2020).

13. Algebra-Geometry-Combinatorics Seminar, University of Illinois at Urbana-Champaign (Sept. 2020).

12. Algebra, Geometry, and Combinatorics: An Online Seminar (Sept. 2020).

11. Combinatorics Seminar, Washington University in St. Louis (Mar. 2020).⋆

10. Commutative Algebra Seminar, University of Minnesota (Mar. 2020).⋆

9. Algebra and Algebraic Geometry Seminar, University of Wisconsin (Nov. 2019).

8. Commutative Algebra Seminar, University of Michigan (Apr. 2019).

7. Combinatorics, Algebra, and Geometry Seminar, George Mason University (Mar. 2019).

6. Commutative Algebra Seminar, University of Utah (Feb. 2019).

5. Algebra and Discrete Mathematics Seminar, Clemson University (Dec. 2018).

4. Algebra Seminar, University of Kentucky (Sept. 2018).

3. Commutative Algebra Seminar, University of Minnesota (Oct. 2017).

2. Commutative Algebra Seminar, University of Michigan (Sept. 2017).

1. Commutative Algebra Seminar, University of Michigan (Sept. 2016).

Conference Talks

31. CombinaTexas (Apr. 2023).

30. Commutative Algebra in the South (C.A.T.S.) (Apr. 2023).

29. Southwest Local Algebra Meeting (Mar. 2023).

28. Texas Algebraic Geometry Symposium (Sept. 2022).

27. FPSAC (July 2022).

26. AMS Sectional Meeting, Special Session on Recent Developments in Commutative Algebra (Mar. 2022).

25. CMS Winter Meeting, Special Session on Combinatorial Methods in Algebraic Geometry and Commutative Algebra (Dec. 2021).

24. CA+, (Oct. 2021).

23. AMS Sectional Meeting, Special Session on Homological Methods in Commutative Algebra (Oct. 2021).

22. CMS Summer Meeting, Special Session on Recent Developments in Gröbner geometry (June 2021).

21. AMS Sectional Meeting, Special Session on Women in Commutative Algebra - One hundred years of Idealtheorie in Ringbereichen (May 2021).

20. AMS Sectional Meeting, Special Session on Commutative Algebra (May 2021).

19. ALGECOM XXI (Apr. 2021).

18. AMS Sectional Meeting, Special Session on Commutative Algebra (Apr. 2021).

17. AMS Sectional Meeting, Special Session on Commutative Algebra and its Interaction with Algebraic Geometry and Combinatorics (Mar. 2021).

16. AMS Sectional Meeting, Special Session on Commutative Algebra and Connections to Algebraic Geometry and Combinatorics (Oct. 2020).

15. AMS Sectional Meeting, Special Session on Recent Developments in Commutative Algebra (Apr. 2020).*

14. AMS Sectional Meeting, Special Session on Combinatorial Algebra and Geometry (Apr. 2020).*

13. CMS Winter Meeting, Special Session on Combinatorial Algebraic Geometry (Dec. 2019).

12. AMS Sectional Meeting, Special Session on Combinatorial Algebraic Geometry (Sept. 2019).

11. AWM Research Symposium, Special Session on Combinatorial Algebra (Apr. 2019).

10. AMS Sectional Meeting, Special Session on Commutative Algebra and its Environs (Mar. 2019).

9. AMS Sectional Meeting, Special Session on Commutative Algebra (Sept. 2018).

8. AMS Sectional Meeting, Special Session on Homological Commutative Algebra (Apr. 2018).

7. Joint Mathematics Meetings, Special Session on Commutative Algebra in All Characteristics (Jan. 2018).

6. AMS Sectional Meeting, Special Session on Commutative Algebra (Sept. 2017).

5. AMS Sectional Meeting, Special Session on Commutative Algebra (Apr. 2017).

4. AWM Research Symposium, Special Session on Commutative Algebra (Apr. 2017).

3. AMS Sectional Meeting, Special Session on Commutative Algebra (Mar. 2017).

2. Route 81 Conference (Sept. 2016).

1. KUMUNU jr. (Apr. 2016).

Expository Talks and Mini-courses

8. Mini-course (3 lectures+problem sessions) on Commutative Algebra in Schubert Calculus at Summer '23 Schubert Summer School at UIUC (June 2023).

7. Mini-course on computational aspects of alternating sign matrix ideals in advance of leading a team to develop a Macaulay2 package at a Macaulay2 coding sprint at the Institute for Mathematics and its Applications (package development co-led with A. Almousa, June 2023).

6. TA for mini-course on Liaison Theory at MSRI/SLMath summer school on Commutative Algebra and its Interaction with Algebraic Geometry (May 2023).

5. EDGE Colloquium (June 2021).

4. MAA MathFest (Aug. 2019).

3. Student Commutative Algebra Seminar, University of Michigan (Jan. 2019, Mar. 2018, Jan. 2017, Oct. 2016, Mar. 2016, Apr. 2016, Nov. 2015, Nov. 2014, Apr. 2014, Feb. 2014, Oct. 2013, Feb. 2013).

2. Frankfest, Williams College (Feb. 2016).

1. Math Club, University of Michigan (Mar. 2014).

Teaching

Regular Semester Classes at Texas A&M University

2. *Modern Algebra I: Math 415* (Spring 2023).
1. *Algebra I: Math 653* (Fall 2022).

Regular Semester Classes at the University of Minnesota

3. *Honors: Fundamental Structures of Algebra I: Math 5285H* (Fall 2020, Fall 2021).
2. *Honors: Fundamental Structures of Algebra II: Math 5286H* (Spring 2021, Spring 2022).
1. *Cryptology and Number Theory: Math 5248* (Fall 2021, Spring 2021, Spring 2020, Fall 2019 (2 sections)).

Regular Semester Classes at the University of Michigan

4. *Calculus I: Math 115*, Instructor of record (Winter 2018, Fall 2016, Fall 2013, Winter 2013, Fall 2012).
3. *Precalculus: Math 110*, Instructor of record (Fall 2017).
2. *Mathematics for Elementary School Teachers: Math 385*, Graduate student instructor (Fall 2014).
1. *Calculus II: Math 116*, Instructor of record (Winter 2014).

M-STEM
Description: Summer program in science and math for incoming University of Michigan undergraduates who express an interest in majoring in a STEM field and who come from high school lacking access to advanced math and science classes.

2. *Math at Michigan: Math 106*, Instructor of record (Summer 2017, Summer 2018).
1. *Math at Michigan: UC 170*, Instructor of record (Summer 2016).

Michigan Math and Science Scholars
Description: Summer program in science and math for high school students held at the University of Michigan.

1. *Fibonacci Numbers*, Assistant to M. Hochster (Summer 2015).

Trainings Attended

6. *Writing and Grading Exams: An Online Workshop*, University of Michigan (November 2017).
5. *Online Workshop: Research-Based Practices for College Teaching*, University of Michigan (July 2017).
4. *Online Workshop: Using Technology to Check Student Understanding and Provide Feedback*, University of Michigan (March 2017).
3. *Inclusive Teaching in Science, Technology, Engineering and Math (STEM) courses*, University of Michigan (May 2016).
2. *Leveraging Group Work and Teams in STEM Courses to Enhance Student Learning*, University of Michigan (May 2016).
1. *Teaching with IBL - 2 Day Workshop*, University of Michigan (September 2015).

Mentoring of Undergraduates

6. Mentor, Summer undergraduate research through University of Minnesota REU. Undergraduates: Ilani Axelrod-Freed, Hanson Hao, Matthew Kendall, and Yuyuan Luo (Summer 2022). Project: *Cohen–Macaulayness of alternating sign matrix varieties.*

5.   Co-mentor (with J. Rajchgot), Summer undergraduate research through NSERC USRA. Undergraduate: Matthew Koban (Summer 2020). Project: *On basic double links of squarefree monomial ideals.*

4.   Mentor through AWM Mentor Network. Mentee: Judy Chiang (Jul. 2020–present).

3.   Mentor, Summer undergraduate research through the Summer Research and Creativity Grant and J.C. Eaves Scholarship, University of Kentucky (Summer 2019). Undergraduates: Alexander Blose, Owen McGrath, Jackson Morris. Project: *Toric double determinantal varieties.*

2.   Assistant mentor, Geometry Lab, University of Kentucky (Spring 2019). Project: *Gonality of hypercubes.*

1.   Assistant mentor, Geometry Lab: Visualization, University of Kentucky (Fall 2018-Spring 2019).

Professional Service

Conference, Special Session, and Seminar Organization

5.   AWM Research Symposium, Special Session on Homological and Combinatorial Aspects of Commutative Algebra, Minneapolis, MN (with C. Berkesch, June 2022).

4.   Commutative Algebra Seminar, University of Minnesota (with J. Yang, Fall 2019–Spring 2021).

3.   Joint Mathematics Meetings, Special Session on Commutative Algebra, Denver, CO (with H. Lindo, Jan. 2020).

2.   Graduate Workshop in Commutative Algebra for Women & Mathematicians of Other Minority Genders, Minneapolis, MN (with C. Berkesch and J. Bruce, Apr. 2019).

1.   AMS Sectional Meeting, Special Session on Developments in Commutative Algebra, Auburn, AL (with E. Grifo, Mar. 2019).

Reviews and Quick Opinions

Journals: *Combinatorial Theory, Journal of the London Mathematical Society, Journal of Software for Algebra and Geometry, Journal of Algebra, Journal of Pure and Applied Algebra, Proceedings of the AMS, Rocky Mountain Journal of Mathematics, Communications in Algebra, Bulletin of the Belgian Mathematical Society, The American Mathematical Monthly*

Other: *International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), BIRS Workshop Proposal, International Symposium on Symbolic and Algebraic Computation (ISSAC)*

Diversity, Equity, and Inclusion

8.   Co-leader (with J. Rajchgot) of a group on "Commutative Algebra in Schubert Calculus" as part of the week-long workshop "Women in Commutative Algebra II" (October 2023).

7.   Mentor in *Roots of Unity*, a week-long workshop designed to support women and non-binary graduate students, particularly those of color, in years 1–3 of graduate school, hosted at University of Minnesota (June 2022).

6.   Diversity Committee/Climate Committee, University of Minnesota (Fall 2019-Spring 2021).

5.   AWM essay contest judge (annually 2017-2022).

4.   Panelist, Graduate Research Opportunities for Women (GROW), Ann Arbor, MI (October 2018).

3.   Association for Women in Mathematics Student Chapter, University of Michigan, founder and president (Winter 2016-Winter 2018).

2.   Climate Committee, University of Michigan (Fall 2016-Winter 2018).

1.   Rackham Student Ally for Diversity, University of Michigan (Summer 2017).

Training and Panel Organization

2.   *So You're (Going to Be) a Postdoc: Now What? A Panel Discussion on a Fulfilling Postdoc Experience*, Joint Mathematics Meetings, Boulder, CO (January 2020).

1. Spectrum Center (LGBTQ+ center) Allyhood Development Training, University of Michigan (Spring 2018).

Outreach

5. Assistant (1-2 events/semester), Detroit Wayne County Math Teachers' Circle, (Fall 2016-Winter 2018).
4. Math host for local seventh graders, Future University, (November 2016).
3. Math circle co-leader (weekly), North Carolina State University (2011-2012).
2. Volunteer instructor, discrete mathematics course for three advanced sixth graders, Williamstown Elementary School (2010-2011).
1. Volunteer assistant, Sixth grade math class, Williamstown Elementary School (2008-2010).

Professional Memberships

American Mathematical Society
Association for Women in Mathematics
National Association of Mathematicians