

# Nathan K. Pflueger

## Contact

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## Professional Positions

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- **Amherst College** 7/2017-present
  - Assistant Professor of Mathematics
- **Brown University** 9/2014-6/2017
  - Tamarkin Assistant Professor of Mathematics.

## Research interests

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- Algebraic geometry, particularly algebraic curves.
- Young tableaux and applications in Brill-Noether theory.
- Tropical curves and linear series.

## Education

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- **Harvard University** 9/2009-5/2014  
Cambridge, MA
  - Ph.D. in Mathematics, May 2014.
  - Adviser: Joe Harris.
  - Thesis: *Regeneration of elliptic chains with exceptional linear series.*
- **Stanford University** 9/2005-6/2009  
Stanford, CA
  - B.S. Mathematics with Honors and Minor in Computer Science, June 2009.
  - J. E. Wallace Sterling Award (for top 25 graduating students in Humanities and Sciences).
  - Spent Autumn 2007 in Hungary at Budapest Semesters in Mathematics.

## Papers

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1. *Versality of Brill-Noether flags and degeneracy loci of twice-marked curves.* 28 pages. Submitted.
2. *Relative Richardson Varieties* (with M. Chan). 21 pages. Submitted.
3. *Weierstrass semigroups on Castelnuovo curves.* Journal of Algebra 582 (2021) 117-135.
4. *Euler characteristics of Brill-Noether varieties* (with M. Chan). Transactions of the AMS 374:3 (2021) 1513-1533.
5. *Combinatorial relations on skew Schur and skew stable Grothendieck polynomials* (with M. Chan). Algebraic Combinatorics Volume 4 (2021) no. 1 p. 175-188.
6. *The Gieseker-Petri theorem and imposed ramification* (with M. Chan and B. Osserman). Bulletin of the London Mathematical Society 51:6 (2019) 945-960.
7. *On non-primitive Weierstrass points.* Algebra and Number Theory 12:8 (2018) 1923-1947.
8. *Genera of Brill-Noether curves and staircase paths in Young tableaux* (with M. Chan, A. López Martín, and M. Teixidor i Bigas). Transactions of the American Mathematical Society 370 (2018), 3405-3439.
9. *Brill-Noether varieties of  $k$ -gonal curves.* Advances in Mathematics 312 (2017) 46-63.
10. *Special divisors on marked chains of cycles.* Journal of Combinatorial Theory, Series A 150 (2017) 182-207.
11. *Bitangents of tropical plane quartic curves* (with M. Baker, Y. Len, R. Morrison, and Q. Ren). Mathematische Zeitschrift 282:3 (2016) 1017-1031.

12. *On linear series with negative Brill-Noether number*. Preprint (2013). 16 pages.
13. *Graph reductions, binary rank, and pivots in gene assembly*. Discrete Applied Mathematics 159:17 (2011) 2117-2134.

## Teaching

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- **Amherst College**

- Summer and Fall 2021 (while on leave):  
Math 498, Senior Honors
- Spring 2020: Math 220, Mathematical Reasoning and Proof  
Math 252, Cryptography  
Math 498, Senior Honors  
Math 390, Independent study on group theory and puzzles  
Unofficial supervisor of a U. Mass graduate reading course on tropical geometry
- Fall 2019: Math 350, Groups, rings, and fields  
Math 272, Linear algebra with applications  
Math 498, Senior honors
- Spring 2019: Math 272, Linear algebra with applications  
Math 252, Cryptography (new course)  
Math 490, Independent study on Commutative Algebra
- Fall 2018: Math 350, Groups, rings, and fields  
Math 105, Calculus with algebra
- Spring 2018: Math 272, Linear algebra with applications  
Math 121, Intermediate calculus
- Fall 2017: Math 272, Linear algebra with applications  
Math 111, Introduction to the calculus

- **Brown University**

- Spring 2017: Algebraic Geometry II
- Fall 2016: Cryptography  
Algebraic Geometry I
- Spring 2016: Algebraic Geometry II
- Fall 2015: Cryptography
- Spring 2015: Introduction to number theory  
Calculus I
- Fall 2014: Calculus II for physics and engineering

- **Harvard University**

- Fall 2013: Introduction to Calculus
  - Wrote comprehensive lecture notes, still in use by students and professors as a course accompaniment.
- Spring 2013: Course Assistant for Tropical Geometry
- Spring 2012: Teaching Fellow for “Fat Chance” (basic probability course for non-majors)
- Fall 2011: Integration, Series, and Differential Equations.
  - Wrote comprehensive lecture notes, still in use by students and professors as a course accompaniment.

- **The Math Circle** (extra-curricular math program for Boston-area children)

- Spring 2016: taught students ages 13 to 15.
- Academic year 2013-2014: taught students ages 13 to 18.
- July 2014 and July 2016: co-organized a math circle teacher training institute in South Bend,

IN.

- Academic year 2012-2013: taught students ages 13 to 18.
- Academic year 2011-2012: taught students ages 7 to 9.

- **Budapest Semesters in Mathematics**

- 2010-2013: Coordinated and coached teams of American students to compete in the International Mathematics Competition for University Students in Blagoevgrad, Bulgaria. Wrote detailed preparation material on the competition problems.

- **Stanford University computer science department**

- Spring 2009: section leader for Programming Abstractions and Methodology (C++).
- Winter 2009: section leader for Programming Abstractions (C++).
- Fall 2008: section leader for Programming Abstractions and Methodology (C++).
- Spring 2008: course helper for Programming Methodology (Java).
- Winter 2008: section leader for Programming Abstractions (C++).
- Spring 2007: section leader for Programming Methodology (Java).

- **Stanford University mathematics department**

- 2006-2009: Tutor for linear algebra and multivariable calculus.
- 2005-2006: Course developer (wrote assignments and exams) for distance learning Calculus C course (through the Education Program for Gifted Youth).

## Service

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- Co-organizer for the Valley Geometry Seminar (2018-present).
- Co-organizer for the Bi-annual Tropical and Algebraic Meetings of Brown and Yale (2014-present), including serving as primary organizer of the Spring 2019 meeting at Amherst College.
- Math Comprehensive exam / honors qualifying exam co-coordinator (2019-2020)
- Co-organizer of the conference “Ideals, Varieties, and Applications,” including serving as Co-PI on an NSF grant funding the conference (June 2019).
- Faculty computing committee member (2019-2020).
- Title IX review committee member (2018-2019).
- Math-major advising (2018-present).
- College advising (2018-present).
- VAP Search committee member (2019).
- Department list keeper (2018-2019)
- Co-organizer of Putnam Exam preparation / problem-solving sessions (Fall 2018 and 2019).
- Chair of Connecticut Valley Colloquium at Amherst College (Fall 2018).
- Assist in grading of Mathematics Comprehensive Exam (2018-present).
- Minutes-taker for Mathematics and Statistics department meetings (2017-2018).
- Co-organizer for the Brown algebraic geometry seminar (2014-2017).
- Served as assistant coach for the San Francisco Bay Area team to the ARML mathematics competition (2008, 2009).

## Invited talks

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- June 2021, Three-part minicourse on Tropical Curves (hosted by Fudan U., Shanghai).
- April 2021, Algebra, Geometry, and Combinatorics Day (hosted by Notre Dame).
- November 2019, Valley geometry seminar (hosted by U. Massachusetts).
- October 2019, Stanford algebraic geometry seminar.
- April 2019, Brown algebraic geometry seminar.
- April 2019, Williams College faculty seminar.
- June 2017, U.C. Irvine number theory seminar.

- March 2017, Brown discrete math seminar.
- February 2017, Valley geometry seminar (at U. Massachusetts).
- May 2016, *Brill-Noether Special Chains of Loops*. Algebraic, Tropical, and Nonarchimedean Analytic Geometry of Moduli Spaces, Oaxaca, Mexico.
- March 2016, Georgia Tech algebraic geometry seminar.
- March 2016, Special session in Interactions Between Algebraic and Tropical Geometry, AMS Spring Sectional Meeting, Athens, GA.
- October 2015, Brown algebraic geometry seminar.
- June 2015, Special Session in Enumerative and Combinatorial Methods in Moduli Theory, AMS-EMS-SPM International Meeting, Porto, Portugal.
- October 2014, Special session on combinatorics and algebraic geometry, AMS Fall Sectional Meeting, San Francisco, CA.
- February 2014, Rice algebraic geometry seminar.
- January 2014, *Towards a tropical Castelnuovo-Severi inequality*. Special session on tropical and non-archimedean geometry, Joint Mathematics Meeting.
- November 2013, Harvard-MIT algebraic geometry seminar.
- November 2013, Brown algebraic geometry seminar.
- October 2013, U. Wisconsin algebraic geometry seminar.
- April 2013, Yale algebraic and tropical geometry seminar.

## Honors and awards

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- NSF Graduate Research Fellowship, 2009-2013.
- Certificate of Distinction in Teaching, Harvard University, Spring 2012.
- Barry M. Goldwater Scholarship, awarded 2007.
- Putnam Mathematics Competition: 24th place (2008)
- International Mathematics Competition for University Students (Blagoevgrad, Bulgaria): 40th place (2008).
- Google Codejam competition: advanced to semifinal round (top 500 contestants) (2009,2010,2012).
- Boothe Prize for Undergraduate Writing: Finalist (Autumn 2005, Winter 2006), 2nd place (Autumn 2005). Prize selects the best essay written for the freshman Introduction to the Humanities requirement at Stanford.
- Hester-Franklin Prize for best original paper written in first-year French (2009).

## Other employment

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- **University of Minnesota, Duluth** (funding from NSF) Summer 2008,2009,2010  
**R.E.U. in Combinatorics** Duluth, MN
  - 2009: Student participant.
  - 2010 and 2011: Graduate student research adviser.
- **D.E. Shaw and Co.** Summer 2007  
**Quantitative Analyst Intern, Futures Group** New York, NY
  - Researched, implemented, and tested computational methods for correlating high-frequency financial instruments.
  - Developed one chosen method into a versatile set of Java and Perl programs for use in research within the hedge fund.
  - Wrote several internal reports detailing the mathematical techniques I investigated.
- **University of Washington** (funding from National Science Foundation) Summer 2006  
**R.E.U. in Inverse Problems for Electrical Networks** Seattle, WA

*Updated: June 15, 2021*