THOMAS KINDRED

Smith College
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PROFESSIONAL EXPERIENCE

Smith College	Visiting Assistant Professor	July 2025-Present
Wake Forest University	Visiting Assistant Professor	July 2024-June 2025
Wake Forest University	Teacher-Scholar Postdoctoral Fellow	July 2021-June 2024
University of Nebraska-Lincoln	Postdoctoral Faculty Fellow	August 2018-May 2021

EDUCATION

University of Iowa, Iowa City, IA   Ph.D. May 2018
Major: Mathematics: geometric topology   M.S. December 2014
Advisor: Dr. Charlie Frohman

Williams College, Williamstown, MA   B.A. June 2007
Major: Mathematics   Highest Honors
Advisor: Dr. Colin Adams

RESEARCH INTERESTS

Geometric topology of knots, surfaces, and solids in 3 and 4 dimensions; computational geometry; combinatorics; computing; quantum topology; quadratic forms; applications to the sciences

Postdoctoral advisors: Dr. Mark Brittenham, Dr. Patricia Cahn, Dr. Hugh Howards, Dr. Alex Zupan

ADVISING EXPERIENCE

Visiting Assistant Professor, Smith College   July 2025-Present

- One-circle Kauffman states (advisor F25-present—five students)
- Triangle number of a spanning surface (advisor F25-present—one student)

Teacher-Scholar Postdoc. Fellow & Visiting Asst. Professor, Wake Forest Univ. July 2021-June 2025

Winston-Salem, NC
- Senior Thesis: applied knot theory in statistical mechanics (advisor F24-S25)
- Senior Thesis: Gauss codes and crosscap numbers (co-advisor S23-S25)
- Master's Thesis: linear algebra via spanning surfaces (co-advisor S23-S24)
- Master's Thesis: Khovanov homology (co-advisor F21-S23)

PUBLICATIONS AND PREPRINTS (student co-authors in bold)

19. *State codes and crosscap numbers of alternating links* (with **I. Bahena** and J. Parsley), in preparation.

18. *A correction factor approach to the Ising model in knot theory* (with **T. Bullock**), in preparation.

17. *Spanning solids and Murasugi sum in dimension four* (with H. Karimi, S. Kim, M. Miller, and P. Naylor), in preparation.

16. *On minimum-length continued fractions for rational numbers* (with M. Cohen, A. Lowrance, P. Shanahan, and C. Van Cott), in preparation.

15. *Average crosscap number of a 2-bridge knot* (with M. Cohen, A. Lowrance, P. Shanahan, and C. Van Cott), 34 pp. arXiv.

14. *Kink-equivalence of matrices, spanning surfaces, 4-manifolds, and quadratic forms* (with H. Howards, W. F. Moore, and **J. Tolbert**), submitted, 19 pp. arXiv

13. *How essential is a spanning surface?*, submitted, 42 pp. arXiv

12. *The virtual flyping theorem,* submitted, 27 pp. arXiv

11. *Primeness of alternating virtual links,* submitted, 32 pp. arXiv

10. *A geometric proof of the flyping theorem,* to appear in Adv. Math., 51 pp. arXiv

9. *End-essential spanning surfaces for links in thickened surfaces,* Topol. Appl. 361 (2025), 109187. link

8. *A simple proof of the Crowell-Murasugi theorem,* Alg. Geom. Topol. 24 (2024), no. 5, 2779-86. link

7. *Efficient multisections of odd-dimensional tori,* Alg. Geom. Topol. 23 (2023), no. 9, 3997-4056. link

6. *Nonorientable spanning surfaces for knots,* Chapter 23 of the Concise Encyclopedia of Knot Theory (2021), 197-203.

5. *Crosscap numbers of alternating knots via unknotting splices,* Internat. J. Math. 31 (2020), no. 7, 2050057, 30 pp. link

4. *Alternating links have representativity 2*. Alg. Geom. Topol. 18 (2018), no. 6, 3339-3362. link

3. *Plumbing essential states in Khovanov homology,* New York J. Math. 24 (2018), 588-610. link

2. *Heegaard diagrams corresponding to Turaev surfaces* (with C. Armond and N. Druivenga), J. Knot Theory Ramifications 24 (2015), no. 4, 1550026, 14 pp. link

1. *A classification of spanning surfaces for alternating links* (with C. Adams), Alg. Geom. Topol. 13 (2013), no. 5, 2967-3007. link

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TEACHING EXPERIENCE

Visiting Assistant Professor, Smith College   July 2025-Present

Northampton, MA   • Graph theory (S26)

• Calculus II (S26)

• Discrete Mathematics: logic, sets, functions, combinatorics, graphs, proofs (F25)

Teacher-Scholar Postdoc. Fellow & Visiting Asst. Professor, Wake Forest Univ.   July 2021-June 2025

Winston-Salem, NC   • Differential Geometry: curves & surfaces in space for grads & undergrads (S25)

• Topology: knot theory & spanning surfaces, computing and applications (S24)

• Introduction to Linear Algebra and Differential Equations (F23, S24)

• Topics in Topology: the linear algebra of curves and surfaces in space (S23)

• Topology: continuity, connectedness, compactness; graduate course (F22)

• Discrete Mathematics: logic, sets, functions, graphs, proofs (F22, S23, F23)

• Calculus with Analytic Geometry I (F21, S22, F24, S25)

Postdoctoral Faculty Fellow, University of Nebraska-Lincoln   August 2018-May 2021

Lincoln, NE   • Topics in Topology: knot theory via spanning surfaces; flipped classroom (S21)

• Linear Algebra (F18, F19, F20)

• Discrete & Finite Math: graphs & combinatorics, proofs; inquiry-based (F20)

• Topology II: fundamental groups, covering spaces, homology; qual course (S20)

• Introduction to Modern Algebra: a "rings first" proofs course (S19, F19)

Instructor, Teaching Assistant, and Tutor, University of Iowa   Fall 2012-May 2018

Iowa City, IA   • Topics in Topology: substitute professor for six weeks post-defense (S18)

• Engineering Math 2: vector calculus with Mathematica (F13, S14, S15, S18)

• Calculus 2 (F17)

• Elementary Functions: precalculus with trig (S17, instructor of record)

• College Algebra (F16, instructor of record)

• Grad topology: general topology, homotopy theory, smooth manifolds (F15-S16)

• Summer prep course for qualifying exam in topology (2015, 2016)

• Engineering Math 1: single-variable calculus (F14)

• Introduction to Undergraduate Research (S13)

• Mathematics for the Biological Sciences (F12)

• Math Tutorial Lab: college algebra through linear algebra (F12-S18)

Math and Physics Teacher, Potts Camp High School   August 2009-May 2012

Potts Camp, MS   • Taught geometry, algebra 2, and trigonometry/precalculus each year

• Also taught calculus first year, physics second year, and both third year

• Volunteered as assistant baseball coach each spring

• Certified through the Mississippi Teacher Corps

Math Teacher, The Charles School   November 2008-May 2009

Columbus, OH   • Taught remedial pre-algebra and fundamentals of math to 9th-graders

Teaching Assistant and Grader, Williams College   September 2004-May 2007

Williamstown, MA   • Graded homework and held office hours for discrete math and real analysis

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SELECTED HONORS & AWARDS

Wake Forest University Thank A Teacher letter recipient	2023, 2024, 2025
MAA Project NExT Fellow	2019
UNL Parents' Recognition Award for Contribution to Students	2019
Bor-Luh Lin Thesis Award	2018
University of Iowa Thank-A-Teacher letter recipient	2016
Catherine Wegner Outstanding Teaching Assistant Award Winner	2015

INVITED AND CONTRIBUTED TALKS

TBD
Five Colleges Geometry and Topology Seminar

Amherst, MA
Spring 2026

TBD
Vassar College Mathematics Colloquium

Poughkeepsie, NY
Spring 2026

TBD
Williams College Mathematics Faculty Seminar

Williamstown, MA
February 2026

Spanning solids and Murasugi sum in dimension four
JMM Special Session on Surfaces in 3- and 4-Manifolds: Theory and Computation

Washington, DC
January 2026

Counting shortest continued fractions, simplest spanning surfaces, and their slope
JMM Special Session on Knots, Links, Geometry, and Related 3-Manifolds

Washington, DC
January 2026

TBD
University of Nebraska-Lincoln Seminar on Groups, Semigroups, and Topology

Lincoln, NE
December 2025

All tied up: an invitation to knot theory in dimensions 3 and 4
Smith College lunch talk

Northampton, MA
September 2025

The Flyping Theorem goes virtual
BIRS: Interactions of geometric & quantum topology focused on links in thickened surfaces

Virtual
April 2025

Downstream lessons from a geometric proof of Tait's flyping conjecture
First International Online Knot Theory Congress

Virtual
February 2025

Average crosscap number of a 2-bridge knot
Joint Math Meetings

Seattle, WA
January 2025

Kink-equivalence of matrices, spanning surfaces, 4-manifolds, and quadratic forms
AMS Sectional Meeting, Special Session

Albany, NY
October 2024

Naive kink equivalence of surfaces and matrices
Undergraduate Knot Theory Conference V

Seattle, WA
July 2024

Naive blowup-equivalence of 4-manifolds
Trisectors Workshop

Lincoln, NE
June 2024

Link diagrams determined by checkerboard surfaces
AMS Sectional Meeting, Special Session

Buffalo, NY
September 2023

The flyping theorem and geography problem for alternating links in thickened surfaces
University of Nebraska-Lincoln Seminar on Groups, Semigroups, & Topology

Virtual
November 2021

A simple proof of the Crowell-Murasugi Theorem
AMS Sectional Meeting, Special Session

Virtual
October 2021

Definite surfaces, plumbing, and Tait's conjectures
Caltech Geometry and Topology Seminar

Virtual
May 2021

Definite surfaces and Murasugi sums: new geometric proofs of two classical theorems
UC Davis Geometry/Topology Seminar

Virtual
May 2021

Replumbing definite surfaces: the geometric content of the flyping theorem MIT Geometry and Topology Seminar	Virtual April 2021	
The future is a 4-manifold. Wake Forest University Department of Mathematics and Statistics Colloquium	Virtual April 2021	
Flyping, plumbing, and symmetries of alternating links McMaster University Geometry and Topology Seminar	Virtual January 2021	
Symmetries of alternating link exteriors, spatial graphs, and branched surfaces Joint Math Meetings	Virtual January 2021	
The geometric content of Tait's conjectures Ohio State CKVK* Seminar	Virtual November 2020	
Spanning surfaces: essence, plumbing, and flypes University of Virginia Geometry Seminar	Virtual October 2020	
A geometric proof of the flyping theorem Oklahoma State Topology Seminar	Virtual September 2020	
Symmetric, efficient multisections of odd-dimensional tori Virtual Trisectors Seminar	Virtual August 2020	
Splice-unknotting and crosscap numbers Nearly Carbon Neutral Geometry and Topology Conference	Virtual June 2020	
Efficient multisections of odd-dimensional tori University of Iowa Topology Seminar	Virtual April 2020	
Checkerboards & crosscaps University of Nebraska-Lincoln Seminar on Groups, Semigroups, & Topology	Lincoln, NE March 2018	
Checkerboards & crosscaps Boston College Geometry-Topology Seminar	Boston, MA March 2018	
Checkerboard plumbings Williams College Faculty Seminar	Williamstown, MA October 2017	
Plumbings of checkerboards AMS Sectional Meetings	Buffalo, NY September 2017	
Plumbing is a natural operation GEAR Junior Retreat	Stanford, CA August 2017	
Alternating links have representativity 2 AMS Sectional Meetings	New York, NY May 2017	
Plumbing in Khovanov homology AMS Sectional Meetings	Minneapolis, MN October 2016	
Khovanov homology detects adequate homogeneous states MAA Mathfest	Columbus, OH August 2016	
What is an alternating link? Advances in Quantum Topology	Iowa City, IA April 2016	

SELECTED SEMINAR TALKS AT THE UNIVERSITY OF NEBRASKA-LINCOLN

Stallings' fibration theorem	GST seminar	April 2021
The future is a 4-manifold.	Landscapes seminar	March 2021
Essence of a spanning surface	GST seminar	October 2020
A geometric proof of the flyping theorem	GST seminar	October 2020
Orderability, surgery, and double-branched covers	GST seminar	October 2019
Orderability of knot groups of fibered knots	GST seminar	October 2019
Heegaard-Kirby diagrams	4-manifolds reading seminar	October 2019
Heegaard splittings and trisections	4-manifolds reading seminar	September 2019
Diagrams of knotted surfaces in 4-space	4-manifolds reading seminar	June 2019
Crosscap numbers of alternating knots via unknotting splices	GST seminar	April 2019
Plumbings of 4-manifolds (2-part talk)	4-manifolds reading seminar	March 2019
Carving, framing, and canceling	4-manifolds reading seminar	January 2019
Essential slopes of a knot (2-part talk)	GST seminar	September 2018

SELECTED SEMINAR TALKS AT THE UNIVERSITY OF IOWA

Checkerboard plumbings	Three minute thesis competition	October 2017
Checkerboard plumbings	GAUSS	October 2017
Quadratic differentials & measured foliations	Topology reading seminar	March 2017
The metric on Teichmuller space	Topology reading seminar	March 2017
Alternating links have representativity 2	Topology seminar	February 2017
Inscribed rectangles & rhombi via Mobius bands	GAUSS	February 2017
Introduction to Teichmuller space	Topology reading seminar	January 2017
Why study hyperbolic geometry?	Student topology seminar	November 2016
Thin triangles imply exponential explosion.	Student topology seminar	November 2016
Surface bundles & the Meyer signature cocycle	Topology reading seminar	October 2016
Plumbing in Khovanov homology	Graduate student seminar	September 2016
Origins and rudiments of hyperbolic geometry	Student topology seminar	September 2016
Geometric structures via gluing of Platonic solids	Topology reading seminar	April 2016
Geometry and topology of 3-manifolds	Topology reading seminar	January 2016

Rational surgery coefficients & the slam dunk move	Topology reading seminar	December 2015
Examples of Dehn surgery on knots	Topology reading seminar	November 2015
Classification of torus bundles and semi-bundles	Topology reading seminar	October 2015
Prime decompositions of 3-manifolds	Topology reading seminar	September 2015
Geometry of alternating links	Topology seminar	March 2015
Invitation to Spivak's <u>Calculus on Manifolds</u>,	Student topology seminar	January 2015
State surfaces in Khovanov homology	Topology seminar	October 2014
The Temperley-Lieb algebra & Jones polynomials	Student topology seminar	April 2014
Geometric & algebraic caps for spanning surfaces	Topology seminar	March 2014
Gromov hyperbolicity	Topology reading seminar	October 2013
Introduction to spanning surfaces	Student topology seminar	September 2012

SERVICE

- **Referee or reviewer** for Algebraic & Geometric Topology, Compositio Mathematica, Illinois Mathematics Journal, International Journal of Mathematics, Journal of Knot Theory and its Ramifications, New York Journal of Mathematics, Osaka Journal of Mathematics, Proceedings A of the Royal Society of Edinburgh, Proceedings of the American Mathematical Society, Proceedings of the London Mathematical Society, Topology and its Applications.

- **Putnam exam co-coordinator** (F18, F19, F20)

- **Great Plains Alliance co-coordinator,** arranging regional talks by UNL grad students (F18-S21)

- **Evaluator** of UNL undergraduate research proposals (S19, S20)

- **Organizer** or co-chair for the following seminars and events:
  - Wake Forest Topology & Geometry Seminar (F24-S25)
  - AMS Special Session on Developments in Knot Theory and Low-Dimensional Topology (F21)
  - Nebraska GST seminar: Groups, Semigroups and Topology (F19)
  - Nebraska 4-manifold reading seminar (F19)
  - Iowa GAUSS: Graduate And Undergraduate Student Seminar (S17-S18)
  - Iowa student topology seminar (S15, F16)
  - Iowa topology reading seminar (F15-S16)

- **Mentor** for younger students and the surrounding community:
  - Volunteered for Math Day at Lucas Elementary School (2017, 2018)
  - Volunteered for Sonia Kovalevsky Day, to encourage high school girls interested in math (2016)

- Welcomed incoming graduate students in the University of Iowa's Buddy Program (2014-2016)
- Served as a Williams College Junior Advisor (F05-S06)

- **Advocate** for students, teachers, and colleagues:
  - Member of the Wake Forest Mathematics Equity Committee (2023-2024)
  - Member of the Wake Forest Chapter of the Math Alliance (2021-2025)
  - Member of the Wake Forest Mathematics Curriculum Committee (2022-2023, 2024-2025)
  - Alternate math delegate to the University of Iowa Graduate Student Senate (2016-2018)
  - Member of the University of Iowa Affordable Housing Task Force (2016)
  - Williams College Olmsted Prize Committee to recognize excellent high school teaching (S06)
  - Student representative on the Williams College Committee on Priorities and Resources (S05-F06)

References available upon request