THOMAS KINDRED

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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

Northampton, MA
- Matrices not from 1-circle Kauffman states (advisor F25-present, eight students)
- Triangle number of a spanning surface (advisor F25-Su26, two students)

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)

20. *Surgery moves connecting all essential spanning surfaces for a 2-bridge link I: continued fractions* (with M. Cohen, A. Lowrance, P. Shanahan, and C. Van Cott), in preparation.

19. *Three formulas for the Ising and Potts invariants of a knot or link* (with **T. Bullock**), submitted, 12 pp. arXiv.

18. *Spanning solids and Murasugi sum in dimension four* (with H. Karimi, S. Kim, M. Miller, and P. Naylor), submitted, 61 pp. arXiv

17. C*rosscap numbers of alternating links via state codes* (with **I. Bahena** and J. Parsley), submitted, 22 pp. arXiv.

16. *How natural of a geometric operation is Murasugi sum?*, submitted, 32 pp. arXiv

15. *How essential is a spanning surface?*, submitted, 22 pp. arXiv

14. *The virtual flyping theorem,* to appear in Proc. Roy. Soc. Edinburgh Sect. A, 40 pp. arXiv

13. *Kink-equivalence of matrices, spanning surfaces, 4-manifolds, and quadratic forms* (with H. Howards, W. F. Moore, and **J. Tolbert**), to appear in Fund. Math., 22 pp. arXiv

12. *Average crosscap number of a 2-bridge knot* (with M. Cohen, A. Lowrance, P. Shanahan, and C. Van Cott), to appear in Alg. Geom. Topol., 34 pp. arXiv.

11. *Primeness of alternating virtual links*, to appear in J. Knot Theory Ramifications, 36 pp. link

10. *A geometric proof of the flyping theorem,* Adv. Math. 482 (2025) C, 110642, 53 pp. link

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

- Topics in Geometry—Polygons and Polyhedra: computational geometry (F26)
- Number Theory: primes, Diophantine problems, cryptography (F26)
- Graph Theory: colorings, decompositions, planarity, applications (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 Amherst, MA
Amherst College Mathematics Colloquium Fall 2026

Constructions of Seifert solids for knotted surfaces in S^4 (2-part talk) Park City, UT
PCMI—Knotted Surfaces in 4-Manifolds—Undergraduate Faculty Program July 2026

The kinking complex of spanning surfaces for a knot or link Oaxaca, Mexico
BIRS CMO: Complexes of Surfaces May 2026

Murasugi sum and arborescence in dimensions 3 and 4 Amherst, MA
Five Colleges Geometry and Topology Seminar March 2026

Spanning solids and Murasugi sum in dimension four Washington, DC
JMM Special Session on Surfaces in 3- and 4-Manifolds: Theory and Computation January 2026

Counting shortest continued fractions, simplest spanning surfaces, and their slope Washington, DC
JMM Special Session on Knots, Links, Geometry, and Related 3-Manifolds January 2026

A funny thing happened on the way to the 4-manifold Williamstown, MA
Williams College Mathematics Colloquium December 2025

Murasugi sum in 3D and 4D Lincoln, NE
University of Nebraska-Lincoln Seminar on Groups, Semigroups, and Topology December 2025

All tied up: an invitation to knot theory in dimensions 3 and 4 Northampton, MA
Smith College lunch talk September 2025

The Flyping Theorem goes virtual Virtual
BIRS: Interactions of geometric & quantum topology focused on links in thickened surfaces April 2025

Downstream lessons from a geometric proof of Tait's flyping conjecture Virtual
First International Online Knot Theory Congress February 2025

From rational numbers to rational knots and back Schenectady, NY
Union College Mathematics Colloquium January 2025

Average crosscap number of a 2-bridge knot Seattle, WA
Joint Math Meetings January 2025

Kink-equivalence of matrices, spanning surfaces, 4-manifolds, and quadratic forms Albany, NY
AMS Sectional Meeting, Special Session October 2024

Naive kink equivalence of surfaces and matrices Seattle, WA
Undergraduate Knot Theory Conference V July 2024

Naive blowup-equivalence of 4-manifolds Lincoln, NE
Trisectors Workshop June 2024

Link diagrams determined by checkerboard surfaces — Buffalo, NY
AMS Sectional Meeting, Special Session — September 2023

The flyping theorem and geography problem for alternating links in thickened surfaces — Virtual
University of Nebraska-Lincoln Seminar on Groups, Semigroups, & Topology — November 2021

A simple proof of the Crowell-Murasugi Theorem — Virtual
AMS Sectional Meeting, Special Session — October 2021

Definite surfaces, plumbing, and Tait's conjectures — Virtual
Caltech Geometry and Topology Seminar — May 2021

Definite surfaces and Murasugi sums: new geometric proofs of two classical theorems — Virtual
UC Davis Geometry/Topology Seminar — May 2021

Replumbing definite surfaces: the geometric content of the flyping theorem — Virtual
MIT Geometry and Topology Seminar — April 2021

The future is a 4-manifold. — Virtual
Wake Forest University Department of Mathematics and Statistics Colloquium — April 2021

Flyping, plumbing, and symmetries of alternating links — Virtual
McMaster University Geometry and Topology Seminar — January 2021

Symmetries of alternating link exteriors, spatial graphs, and branched surfaces — Virtual
Joint Math Meetings — January 2021

The geometric content of Tait's conjectures — Virtual
Ohio State CKVK* Seminar — November 2020

Spanning surfaces: essence, plumbing, and flypes — Virtual
University of Virginia Geometry Seminar — October 2020

A geometric proof of the flyping theorem — Virtual
Oklahoma State Topology Seminar — September 2020

Symmetric, efficient multisections of odd-dimensional tori — Virtual
Virtual Trisectors Seminar — August 2020

Splice-unknotting and crosscap numbers — Virtual
Nearly Carbon Neutral Geometry and Topology Conference — June 2020

Efficient multisections of odd-dimensional tori — Virtual
University of Iowa Topology Seminar — April 2020

Checkerboards & crosscaps — Lincoln, NE
University of Nebraska-Lincoln Seminar on Groups, Semigroups, & Topology — March 2018

Checkerboards & crosscaps — Boston, MA
Boston College Geometry-Topology Seminar — March 2018

Checkerboard plumbings — Williamstown, MA
Williams College Faculty Seminar — October 2017

Plumbings of checkerboards — Buffalo, NY
AMS Sectional Meetings — September 2017

Plumbing is a natural operation — Stanford, CA
GEAR Junior Retreat — August 2017

Alternating links have representativity 2 — New York, NY
AMS Sectional Meetings — May 2017

Plumbing in Khovanov homology — Minneapolis, MN
AMS Sectional Meetings — October 2016

Khovanov homology detects adequate homogeneous states — Columbus, OH
MAA Mathfest — August 2016

What is an alternating link? — Iowa City, IA
Advances in Quantum Topology — 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 Calculus on Manifolds,	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 the Green Chicken math competition at Williams College (2026)
  - 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)
  - Williams College Junior Advisor (F05-S06)
  - Student representative on the Williams College Committee on Priorities and Resources (S05-F06)

References available upon request