EXHIBIT 5

Curriculum Vitae
Summer 2014

CONTACT INFORMATION

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PROFESSIONAL TRAINING

Ph.D.	1998	University of Minnesota, Mathematical Physics
B.A.	1992	St. Cloud State University, Minnesota, Mathematics

PROFESSIONAL EXPERIENCES

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2011	–	Present	Associate Professor of Mathematics, Western Michigan University
2004	–	2011	Assistant Professor of Mathematics, Western Michigan University
2002	–	2004	Assistant Professor of Mathematics, William Paterson University of New Jersey
2000	–	2002	Assistant Professor of Applied Mathematics, Southeast Missouri State University
1998	–	2000	Post-doctoral Fellow. McGill University, Montreal
1992	–	1998	Teaching Assistant, University of Minnesota, Minneapolis

PROFESSIONAL RECOGNITION

GRANT PROPOSALS IN PROCESS

2014	National Science Foundation. "Collaborative Research: A Multidisciplinary Change Model for Biomathematics Education Utilizing Modern Discrete Mathematical Concepts," Terrell Hodge as PI.

UNFUNDED GRANT PROPOSALS

2013	National Science Foundation. "Collaborative research: Advancing and institutionalizing the use of modern discrete mathematical methods for modeling in the biological sciences," Terrell Hodge as PI.
2010	National Science Foundation, Standard Grant in Combinatorics, "The Theory of Ghost Symmetry".
2009	National Science Foundation, Standard Grant in Combinatorics, "Realization Spaces of Ghost Symmetries".
2008	National Security Agency, Standard grant in mathematics, "Ghost symmetry and symmetry recovery of point configurations".

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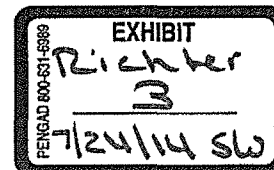
PUBLICATIONS

JOURNAL ARTICLES

- Splints of classical root systems. *Journal of Geometry.* **103**, Number 1 (2012), 103–117.

- Ghost symmetry and an analogue of Steinitz's theorem. *Beitr. Algebra Geom.* **52**, number 1, (2011) 205–219.

- How to draw a Tait-colorable graph. Revised Accepted Papers, *Proceedings of the 18th International Symposium on Graph Drawing.* Konstanz, Germany, September 22-24, 2010.

- A Primer on Ghost Symmetry. In preparation.

- Lie superalgebras associated with constant sectional curvature. *Geometriae Dedicata.* **112**, Number 1, (2005) 129–140.

- Gosset's figure in a Clifford algebra. *Advances in Applied Clifford Algebras*, **14**, Number 2, (2004) 215–224.

- Semisimple Lie algebras of differential operators. *Acta Applicandae Mathematicae.* **66**, Number 1, (2001), 41–65.

- Colored brackets and 2-manifolds. *Journal of Geometry and Physics.* **39**, (2001) 1–8.

- $\mathbb{Z}$-gradations of Lie algebras and infinitesimal generators. *Journal of Lie Theory,* **9** (1999) 113–123.

- Quantization of cohomology in semisimple groups. Coauthored with Robert Milson. *Journal of Lie Theory,* **8** (1998) 401–414.

- Convergent ratios of parallel recursive functions. *Pi Mu Epsilon Journal,* **9** Number 3, (1990), 145–153.

OTHER PUBLICATIONS

- Green Quaternions, Tenacious Symmetry, and Octahedral Zome. Coauthored with Scott Vorthmann. Proceedings of the 2006 conference "Bridges: Mathematical Connections between Art, Music, and Science".

- Two results concerning the Zome model of the 600-cell. Proceedings of the 2005 conference "Bridges: Mathematical Connections between Art, Music, and Science".

- Thesis: *Semisimple Lie Algebras of Differential Operators.* 1998.

PRESENTATIONS

PRESENTATIONS AT PROFESSIONAL CONFERENCES

- "Weak Universality for Parallel Drawings." SIAM Conference on Discrete Mathematics, Minneapolis, June 2014.

- "Necessarily Flat Polytopes." SIAM Conference on Discrete Mathematics, Minneapolis, June 2014.

- "Polyhedral Gluings of Outerplanar Graphs." 4th Canadian Discrete and Algorithmic Mathematics Conference, Memorial University of Newfoundland, June 2013.

- "Theory and Examples of Ghost Symmetry." Invited Talk. Special Session on the Combinatorics of Polytopes. AMS/MAA National Meetings, Boston. January 2012.

- "How to Draw an Edge-Colored Graph." Invited Talk. Workshop on Rigidity and Symmetry, Fields Institute, Toronto, October 2011.

- "How to Draw a 4-Edge-Colored Graph." 3rd Canadian Discrete and Algorithmic Mathematics Conference, Victoria, British Columbia, May 2011.

- "How to Draw a Tait-Colored Graph." 18th International Symposium on Graph Drawing, Konstanz, Germany, September 2010.

- "How to Draw a Tait-Colored Graph." SIAM Conference on Discrete Mathematics, Austin, Texas, June 2010.

- "A Survey of Ghost Symmetry." Third Texas Southmost Geometry and Topology Conference, South Padre Island, Texas, April 2010. (Invited.)

- "Ghost Symmetries in the Plane." Special Session on Discrete Geometry, Winter Meeting of the Canadian Mathematical Society, Windsor, Ontario, December 2009.

- "Ghost Symmetries of Codes." Combinatorial Configurations and their Applications, Michigan Technological University, August 2009.

- "Ghost Symmetries of Group Codes and their Projections." 2nd Canadian Discrete and Algorithmic Mathematics Conference, Montreal, May 2009.

- "Theory and Examples of Ghost Symmetry." AMS Spring Eastern Section Meeting, Worcester Polytechnic Institute, April 2009.

- "The Zome System is not Desarguesian." AMS Fall Central Section Meeting, Western Michigan University, Kalamazoo, October 2008.

- "Symmetry Recovery from Ghosts." SIAM Conference on Discrete Mathematics, University of Vermont, Burlington, June 2008.

- "Lie Superalgebras of Matrix Differential Operators." Applications of Computer Algebra, Oakland University, Rochester, Michigan, July 2007.

- "Green Quaternions, Tenacious Symmetry, and Octahedral Zome." Annual meeting of "Bridges: Mathematical Connections between Art, Music, and Science", London, August 2006.

- Led the construction of a large Zome model of the omnitruncated 120/600-cell, with Daniel Duddy and Scott Vorthmann. Subsequently the model was donated to the London Knowledge Lab. Bridges: Mathematical Connections between Art, Music, and Science, London, UK, August 2006.

- "Zome Models in the Classroom." Michigan section of Project NExT, Calvin College, May 4, 2006.

- "Two Results Concerning the Zome model of the 600-Cell." Annual meeting of "Bridges: Mathematical Connections between Art, Music, and Science", Banff, August 2005.

- Led the constructions of two large Zome models of the cantellated 120- and 600-cells, with Daniel Duddy. Subsequently the models were donated to the Banff International Research Station and the Pacific Institute for Mathematical Sciences. Bridges: Mathematical Connections between Art, Music, and Science, Banff, Alberta, August 2005.

- Coordinated the construction of a 4-ft Zome model of the rectified 600-cell. Bridges: Mathematical Connections in Art, Music, and Science, Winfield, Kansas, July 2001.

- "Colored Brackets and Two-Manifolds." MAA Missouri Section Meeting. Rolla, Missouri, April 2001.

- "Lie Superalgebra Bundles over Riemannian Manifolds." Special Session on Low-Dimensional Geometry and Topology, AMS/MAA Joint National Meeting. New Orleans, January 2001.

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- "Generalized Matrix Riccati Equations." AARMS-CRM Conference on Bäcklund and Darboux Transformations, Halifax, Nova Scotia, June 1999.

OTHER PRESENTATIONS

- "Introduction to GAP." WMU Algebra Seminar, February 2014.

- "The Splits-Equivalence Theorem in Phylogenetics." WMU Graph Theory Seminar, February 2013.

- "LaTeX Workshop." Pi Mu Epsilon/Mathematics Club, Western Michigan University, February 2012.

- "Root Systems of Rank-Infinity Lie Algebras." Algebra Seminar, Western Michigan University, February 2012.

- "Ghost Symmetry and a Quest for Universality." Mathematics Colloquium, Western Michigan University, February 2012.

- "Realization Spaces of Generalized Parallelograms." Graph Theory Seminar, Western Michigan University, December 2011.

- "Symmetrical Shadows: What ghosts can tell us." Physics/Mathematics/Computer Science Colloquium, Kalamazoo College, April 2011.

- "What on earth is that big spiky ball in the Rood Hall computer lab?!" Pi Mu Epsilon/Mathematics Club, Western Michigan University, March 2011.

- "A Survey of Ghost Symmetry." Mathematics Colloquium, Cleveland State University, March 2010.

- "How to Draw a Tait-Colored Graph." Graph Theory Seminar, WMU, February 2010.

- "The Compound of Seventy-Five 16-Cells." Led the construction of a large Zome model at Utah Valley University, March 10, 2009.

- "The Fifty-Nine Icosahedra, a Pilgrimage." A presentation of stereographs from a visit to the University of Cambridge. Pi Mu Epsilon, WMU, January 2009.

- "Theory and Examples of Ghost Symmetry." Colloquium, Western Michigan University, November 2008.

- "The Miracle Octad Generator", WMU Algebra Seminar, Spring 2007.

- "The Final Stellation of the 120-Cell." Led the construction of a large Zome model at Western Michigan University, March 24, 2007.

- "Representations of Complex Semisimple Lie Algebras", WMU Algebra Seminar, Fall 2006.

- Readings in the WMU Topology Seminar, October 2006 and February 2007.

- "A Lecture on Buildings", WMU Algebra Seminar, March 2006.

- "Zome Geometry Workshop", MAA Michigan Section meeting, May 2006.

- "The Graduate Program at WMU". With Christine Browning, at the Michigan Undergraduate Mathematics Conference at the University of Michigan, Flint, October, 2005.

- "Lie Superalgebras in Differential Geometry". WMU Topology Research Seminar, September 2005.

- "From Quasi-Exact Solvability to Lie Superalgebras". Mathematics Colloquium, University of Wisconsin, Milwaukee, May 2005.

- "Quasicrystalline Zome". Presentation to Pi Mu Epsilon of WMU, January 2005.

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- Construction of a 4-ft Zome model of the rectified 600-cell with Pi Mu Epsilon of WMU, January 2005.

- "Zome Geometry Workshop". Presentation to Pi Mu Epsilon of WMU, December 2004.

- "Zome Geometry Workshop". Presentation to Math Club at William Paterson University, March 2004.

- "How to Visualize the Fourth Dimension". Presentation to the Math Club at William Paterson University, December 2003.

- A gift to the Mathematics Department at William Paterson University of a model of a projected 600-cell made from drinking straws, Summer 2004.

- "Lie Superalgebras of Matrix Differential Operators". Series of Mathematics Department colloquium talks, William Paterson University, Fall 2002.

- "Quasi-Exact Solvability". Mathematics Department colloquium, Southeast Missouri State University, Spring 2001.

- Various talks at the University of Saskatchewan, Towson University, The North Adams College of Liberal Arts, The State University of New York at Brockport, The University of Central Arkansas at Conway, Pennsylvania State University Berks-Lehigh Valley, 2000, 2002, and 2004.

- "Colored Brackets and 2-Manifolds". Geometry-Topology research seminar, L'Université du Québec à Montréal, Spring 2000.

- "ℤ-Gradations of Lie Algebras and Infinitesimal Generators". Centre de recherches mathématiques, Université de Montréal, Québec. October 1998.

- A gift to the Institute of Technology Center for Educational Programs at the University of Minnesota of models of two different unfoldings of the regular 120-cell, summer 1998.

- A gift to the Mathematics Department at St. Cloud State University of an assortment of 30 paper models of polyhedra, summer 1992.

- "Polyhedron Models". Presentation to the Math Club at St. Cloud State University, Spring 1990.

WORKING CONFERENCES

- Innovations in Mathematics Education via the Arts, Banff, Alberta, January 2007. Invited to "brainstorm to identify promising areas and techniques for a wider movement of math education via the arts."

- "Chicago Zomeposium". Organized a meeting of Zome users and developers, to discuss potential projects related to the Zome System, September 2005.

- Invited by Alexander Turbiner to discuss progress and problems in our common research areas. Nuclear Sciences Institute of Universidad Nacional Autónoma de México, October 2002.

PROFESSIONAL AFFILIATIONS

- American Mathematical Society
- Mathematical Association of America

PROFESSIONAL SERVICE

REVIEWS/REFEREE/EDIT

- Referee for *Symmetry, Integrability, and Geometry: Methods and Applications*, 2014

- Nominated for associate editorship for "Bridges: Mathematical Connections in Art, Music, and Science", 2009.

- Referee for *Journal of Lie Theory*, 1999 and 2007.

- Referee for proceedings of "Bridges: Mathematical Connections in Art, Music, and Science", 2006, 2007, and 2009.

- Referee for *Mathematics Magazine*, 2006.

- Reviewer for *Mathematical Reviews*, 2001-2003.

- Referee for *Acta Applicandae Mathematicae*, 1998.

LOCAL/STATE/NATIONAL ORGANIZATIONS

- Scored exams for the Middle School Math Meet, as part of the World's Largest Mathematics Event, Southwestern College, Dowagiac, Michigan, April 2005 and April 2006.

- Garden State Undergraduate Mathematics Conference/Mathematical Association of America of New Jersey section meeting, Rutgers University, March 2004. Wrote and graded problems for the inaugural Undergraduate Mathematics Competition held during the meeting.

INSERVICE PROGRAMS AND WORKSHOPS

- Invited to instruct a group of elementary and secondary education teachers in the use of Zome for teaching spatial geometry. Mathematics in Action, Grand Valley State University, Grand Rapids, Michigan, February 22, 2007.

- Presenter for the High-School Proficiency Assessment Marathon for Eastside High-School, Paterson NJ, February 2004.

- Conducted a week-long course on constructing paper models of polyhedra to middle-school students, as part of the Horizons summer school at Southeast Missouri State University, Summer 2002.

- Science Fair Judge, once at the St. George school in Montreal and twice at Southeast Missouri State University, 1999-2002.

- Project Gamma, March 1998. At the Mathematics Fun Fair at the University of Minnesota, used a variety of manipulatives to illustrate ideas of groups and symmetry to students in the 8th and 9th grades.

UNIVERSITY SERVICE

- "Major Excitement". Festival to celebrate and discuss major programs of study at WMU, Fall 2006 and Fall 2007.

- Show-Me Days. Encouraged high-school students to attend Southeast Missouri State University during open-campus events on three different occasions.

- Master's Thesis Committee, Southeast Missouri State University, Fall 2001

DEPARTMENT SERVICE

- Algebra Seminar, Fall 2013–Present

- Organized Departmental Picnic, Fall 2011 and Fall 2012

- Awards Committee 2010–2013

- Alavi Award Committee 2010-2013

- Supplied background graphics for promotion/information pamphlets, 2007.

- Algebra Committee, Summer 2005–Present.

- Curriculum Committee, William Paterson University, Spring 2005

- Library Committee, Southeast Missouri State University, 2001–2002

- Graduate Student Committee, McGill University, Spring 1999

PROJECTS DIRECTED

UNDERGRADUATE RESEARCH

- Directed research by high-school students Ryan Bradstreet and Benjamin King on Conway's "Game of Life", December 2005-April 2006.

- Undergraduate Advisor for Michael Pettineo, William Paterson University, Summer 2004

- Undergraduate Advisor for Ginger Pfizenmayer, William Paterson University, Spring 2004

ACTIVITIES RELATED TO INSTRUCTION

SEMINARS DIRECTED

- Algebra Seminar, Fall 2013 – Present

- Algebra Seminar, Summer 2005 – Spring 2008.

INDEPENDENT STUDIES

- Directed study of fiber polytopes for Joshua Tymkew, Spring 2014.

- Directed study of convex polytopes for Joshua Tymkew, Spring 2013.

- Directed study of convex polytopes for Sean English, Spring 2010.

- Directed studies in representation theory of finite groups for Benjamin Phillips, Daniel Sievewright, and David Tannor, Spring 2009

- Directed study of permutation groups for Benjamin Phillips, Fall 2008

- Directed study of abstract algebra for Rebecca Dibbs, Fall 2007

- Directed study of abstract algebra for Kathy Gulliver, Spring 2007

Courses Taught

Note: The designation (G) indicates a graduate-level course.

Spring 2014	Calculus II, Introduction to Topology
Fall 2013	Calculus II, Differential Equations and Linear Algebra
Spring 2013	Calculus II, Elementary Linear Algebra
Fall 2012	Elementary Linear Algebra, Differential Topology (G)
Spring 2012	Calculus I, Calculus II
Fall 2011	Calculus I for Science and Engineering, Multivariate Calculus
Spring 2011	Modern Algebra I, Elementary Linear Algebra
Fall 2010	Differential Equations and Linear Algebra, Calculus II
Spring 2010	Differential Equations and Linear Algebra, Abstract Algebra I (G)
Fall 2009	Differential Equations and Linear Algebra, Multivariate Calculus
Spring 2009	Calculus II, Multivariate Calculus
Fall 2008	Calculus I (Honors section), Modern Algebra I (G)
Spring 2008	Introduction to Topology
Fall 2007	Calculus I (Honors section), Modern Algebra I (G)
Spring 2007	Calculus II (Honors section), Abstract Algebra II (G)
Fall 2006	Calculus I (Honors section, Abstract Algebra I (G)
Spring 2006	Calculus II, Abstract Algebra I (G)
Fall 2005	Calculus II, Fundamental Concepts of Geometry
Spring 2005	Calculus II, Elementary Linear Algebra
Fall 2004	Calculus I, Calculus II
Summer 2004	Introduction to Geometry
Spring 2004	Precalculus, Calculus II, Introduction to Topology
Fall 2003	Contemporary Mathematics, Calculus II, Introduction to Geometry
Spring 2003	Algebra and Geometry with Applications, Calculus II
Fall 2002	Contemporary Mathematics, Calculus I
Spring 2002	Calculus II, Projective Geometry
Fall 2001	Trigonometry, College Algebra, Advanced Calculus
Summer 2001	College Algebra (online), Introduction to Geometry
Spring 2001	Applied Calculus, Methods of Mathematical Research (G)
Fall 2000	College Algebra, Trigonometry
Spring 2000	Linear Algebra
Fall 1999	Calculus II
Fall 1998	Linear Algebra
Summer 1997	Calculus II
Summer 1993	Calculus II

Professional Development

Meetings/Conferences Attended

- "The Mathematics of Klee and Grünbaum: 100 Years in Seattle." University of Washington. July 2010.

- Joint meetings of the AMS, MAA, and others, Phoenix, January 2004.

- "Workshop on Group Theory and Numerical Analysis." Centre de recherches mathématiques, Université de Montréal, Québec. May 2003.

- Invited participant in "Special Functions in the Digital Age." Institute for Mathematics and its Applications,

Minneapolis, Minnesota, July 2002.

- "6th Conference on Clifford Algebras." University of Tennessee in Cookeville, May 2002.

- "Integrable Systems: From Classical to Quantum." Montreal, July 1999. This summer school was the 1999 session of the Séminaire de Mathématiques Supérieures.

- IAS/Park City Mathematics Institute, July 1998.

- "Workshop on Quantum Dynamics." Fields Institute, Toronto, May 1996.

- MAA Mathfest. University of Minnesota, Minneapolis, Summer 1994.

OTHER ACTIVITIES

- Won a set of $12^3 = 1728$ Zen Magnets (a "Mandala Set") for an essay in opposition to the proposed ban on the sale of rare-earth magnet desk sets by the US Consumer Products Safety Commission, Fall 2012.

- Zometool beta tester, December 2007. I tested a proposed new product line for Zometool, Inc.

- Completed an art course "Introduction to Welding" at the Smartshop Metal Arts Center in Kalamazoo, November 2007. I took this course so that I could make a physical model of an example of ghost symmetry built from steel.

- Won 2nd prize for my stereographic slide, "Tulips in Holland", Stereographic Weekend, Cleveland, Ohio, May 2007.

- Consultation with Scott Vorthmann on vZome, a program similar to Geometer's Sketchpad which allows the user to build "virtual" Zome-like 3-dimensional models on a computer screen, 2005-2007.

- Maintains a growing collection of manipulatives which have evident application in the instruction of various ideas in algebra, geometry, and topology.

- Maintains a growing website cataloging physical models of mathematical ideas, with particular emphasis on models which can be built using readily available materials.