

CHARLES F. DORAN

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EDUCATION

Ph.D. Mathematics, Harvard University, 1999

Advisors: Barry Mazur and Shing-Tung Yau. Thesis: Picard-Fuchs Uniformization and Geometric Isomonodromic Deformations: Modularity and Variation of the Mirror Map

A.M. Mathematics, Harvard University, 1993

A.B. Mathematics, Harvard University, 1992

FACULTY POSITIONS

University of Alberta, Department of Mathematical and Statistical Sciences.

Full Professor, with tenure, 2013-present. McCalla Professor of Science, 2013-2014.

Associate Professor, with tenure, 2008-2013.

University of Washington, Department of Mathematics.

Affiliate Associate Professor, 2009-2011. Assistant Professor, Department of Mathematics, 2003-2008.

On leave at Columbia University during 2003-2004.

University of Washington, Department of Physics.

Adjunct Assistant Professor, Department of Physics, 2006-2008.

Columbia University, Department of Mathematics.

VIGRE/Ritt Assistant Professor, 2000-2004. Advisors: Brian Greene and John Morgan.

The Pennsylvania State University, Department of Mathematics.

S. Chowla Research Postdoctoral Fellow, 1999-2000. Advisor: Jean-Luc Brylinski.

PROFESSORSHIPS

Brown University. *Visiting professor, ICERM.*

United States National Science Foundation's Institute for Computational and Experimental Research in Mathematics (ICERM). 2017-2018 (US \$30,000)

University of Maryland. *Visiting Campobassi Professor, Department of Physics.*

First ever professorship funded by the Campobassi endowment, in recognition of my research on "supersymmetry, Adinkras, Calabi-Yau manifolds, [and] string theory foundations." 2015-2017 (US \$100,000)

University of Alberta. *McCalla Professorship, Faculty of Science*

From the University of Alberta website: "outstanding academics who have made significant contributions to their field of research, teaching, and learning." 2013-2014 (CDN \$32,000)

CITIZENSHIP: USA (birth), Canada (naturalized 2015)

RESEARCH AWARDS

Mathematical Association of America (MAA). *Merton M. Hasse Prize*

For the paper *From Polygons to String Theory* written with my former student, Ursula Whitcher. Previous winners of the prize include 2014 Fields Medalist, Manjul Bhargava, and former President of the MAA, Francis Su. 2015 (US \$1,000)

Natural Sciences and Engineering Research Council (NSERC) Discovery Grant

PI on *New Calabi-Yau Geometries in String Theory and Supersymmetry*, 2017-2022 (CDN \$150,000)
PI on *Calabi-Yau Geometry and Mirror Transforms of the Hodge Conjecture*, 2010-2017 (CDN \$210,000)

NSERC-Subatomic Physics, Individual Discovery Grant

PI on *Calabi-Yau Geometry, String Dualities, and Off-Shell Supersymmetry*, 2009-2010 (CDN \$25,000)

National Science Foundation SCREMS Grant

Co-PI with William Stein on *The Computational Frontiers of Number Theory, Representation Theory, and Mathematical Physics*, 2008-2011 (US \$106,869).

University of Washington

Co-PI on Royalty Research Fund Award, *Mathematical Aspects of S-Duality*, with Amer Iqbal, 2007-2008 (US \$31,099). College of Arts and Sciences Junior Faculty Development Award, 2004 and 2007. PI on Royalty Research Fund Scholar Award, *The Mathematics of String Dualities: Computational Approaches*, 2006 (US \$15,612). Department of Mathematics Faculty Excellence Award, 2005-2006.

TEACHING GRANTS

Teaching and Learning Enhancement Fund (TLEF)

PI on *Computer-based Content Across the Mathematics Curriculum*, 2013-2016 (CDN \$136,606)
This was the largest TLEF award at the University of Alberta in 2013.

Alberta Ingenuity Fund

PI on *Alberta Summer Mathematics Institute for High School Students*, 2010 (CDN \$10,000). ASMI was awarded CDN ~\$30,000/year through the PIMS-AAET grants from 2011 through 2016.

INSTITUTIONAL GRANTS

NSERC Collaborative and Thematic Resources Support in Mathematics and Statistics (CTRMS)

Co-PI on PIMS Grant, 2014-2019 (CDN \$5,750,000)

PIMS Collaborative Research Group (CRG) in Geometry and Physics

PI, 2013-2016 (CDN \$224,900). This CRG has brought hundreds of researchers and students in Geometry and Physics to Western Canada, with events at both the University of Alberta and UBC.

National Science Foundation (NSF)

Primary author of an NSF grant, administered by Ron Donagi at the University of Pennsylvania, in support of American participation at the String-Math 2014 events (US \$100,000).

Alberta Advanced Education and Technology

Co-PI on PIMS Grant, 2010-2014 (CDN \$1,210,000).
Co-PI on PIMS Grant, 2014-2017 (CDN \$1,200,000).

PIMS CRG in L-Functions and Number Theory

Co-PI, 2010-2013 (CDN \$200,000).

NSERC Research Tools and Instruments Grant

PI on *University of Alberta PIMS Collaborative Research Environment*, 2010-2011 (CDN \$23,630).

University of Alberta China Institute Special Faculty Initiative

PI on *Alberta-China Mathematics Institutes*, 2010-2012 (CDN \$5,000)

PUBLICATIONS AND PREPRINTS

Refereed Publications:

1. Hodge Numbers from Picard-Fuchs Equations.

Charles Doran, Andrew Harder, Alan Thompson. SIGMA 13 (2017), 045, 23 pages.

2. Off-shell Supersymmetry and Filtered Clifford Supermodules.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber. Algebras and Representation Theory, DOI: 10.1007/s10468-017-9718-8, July 2017.

3. Vertical D4-D2-D0 Bound States on K3 Fibrations and Modularity.

Vincent Bouchard, Thomas Creutzig, Duiliu-Emanuel Diaconescu, Charles Doran, Callum Quigley, Artan Sheshmani. Communications in Mathematical Physics 350, 1069-1121 (2017).

4. Picard-Fuchs Uniformization of Modular Subvarieties.

Brent Doran, Charles Doran, Andrew Harder. 31 pages. To appear in *Uniformization, Riemann-Hilbert Correspondence, Calabi-Yau Manifolds, and Picard-Fuchs Equations*, Institut Mittag-Leffler.

5. Mirror Symmetry, Tyurin Degenerations, and Fibrations on Calabi-Yau Manifolds.

Charles Doran, Andrew Harder, Alan Thompson. 38 pages. To appear in *String-Math 2015*.

6. Special Function Identities from Superelliptic Kummer Varieties.

Adrian Clingher, Charles Doran, Andreas Malmendier. 46 pages. To appear in Asian Journal of Mathematics.

7. An Application of Cubical Cohomology to Adinkras and Supersymmetry Representations.

Charles Doran, Kevin Iga, Greg Landweber. To appear in *Annales de l'Institut Henri Poincaré D: Combinatorics, Physics and their Interactions*.

8. Calabi-Yau Threefolds Fibred by Mirror Quartic K3 Surfaces.

Charles Doran, Andrew Harder, Andrey Novoseltsev, Alan Thompson; 2016; *Advances in Mathematics*, Volume 298, 6 August 2016, 369-392.

9. Toric Degenerations and Laurent Polynomials related to Givental's Landau-Ginzburg Models.

Charles Doran, Andrew Harder. 24 pages; 2016; *Canadian Journal of Mathematics*, Volume 68 (2016), 784-815.

10. Calabi-Yau Threefolds Fibred by Kummer Surfaces Associated to Products of Elliptic Curves.

Charles Doran, Andrew Harder, Andrey Novoseltsev, Alan Thompson; 2016; In *String-Math 2014*, American Mathematical Society, Proceedings of Symposia in Pure Mathematics 93, 278-303.

11. Humbert Surfaces and the Moduli of Lattice Polarized K3 Surfaces.

Charles Doran, Andrew Harder, Hossein Movasati, Ursula Whitcher; 2016; In *String-Math 2014*, American Mathematical Society, Proceedings of Symposia in Pure Mathematics 93, 124-155.

12. The 14th Case VHS via K3 Fibrations.

Adrian Clingher, Charles Doran, Jacob Lewis, Andrey Novoseltsev, Alan Thompson; 2016; In *Recent Advances in Hodge Theory: Period Domains, Algebraic Cycles, and Arithmetic*, Cambridge University Press, London Mathematical Society Lecture Note Series 427, 165-227.

13. Geometrization of N-Extended 1-Dimensional Supersymmetry Algebras, I.

Charles Doran, Kevin Iga, Jordan Kostiuk, Greg Landweber, Stefan Méndez-Diez; 2015; *Advances in Theoretical and Mathematical Physics*, Volume 19 (2015) Number 5, pp. 1043-1113.

14. Families of Lattice Polarized K3 Surfaces with Monodromy.

Charles Doran, Andrew Harder, Andrey Novoseltsev, Alan Thompson; 2015; *International Mathematics Research Notices*, 2015 (23): 12265-12318.

15. String Theory on Elliptic Curve Orientifolds and KR-Theory.

Charles Doran, Stefan Méndez-Diez, Jonathan Rosenberg; 2014; *Communications in Mathematical Physics*, April 2015, Volume 335, Issue 2, pp. 955-1001.

16. Algebraic Cycles and Local Quantum Cohomology.

Charles Doran, Matt Kerr; 2014; *Communications in Number Theory and Physics*, Volume 8 (2014), Number 4, pp. 703-727.

17. Normal Functions, Picard-Fuchs Equations, and Elliptic Fibrations on K3 Surfaces.

Xi Chen, Charles Doran, Matthew Kerr, James Lewis; 2014; Journal für die reine und angewandte Mathematik (Crelles Journal), DOI: 10.1515/crelle-2014-0085, November 2014.

18. T-Duality for Orientifolds and Twisted KR-Theory.

Charles Doran, Stefan Méndez-Diez, Jonathan Rosenberg; 2014; Letters in Mathematical Physics; November 2014, Volume 104, Issue 11, pp. 1333-1364.

19. Short Tops and Semistable Degenerations.

Ryan Davis, Charles Doran, Adam Gewiss, Andrey Novoseltsev, Dmitri Skjorshammer, Alexa Syryczuk, Ursula Whitcher; 2014; Experimental Mathematics, Volume 23, Issue 4, 2014, pp. 351-362.

20. On General Off-Shell Representations of Worldline (1D) Supersymmetry.

Charles Doran, Tristan Hübsch, Kevin Iga, Gregory Landweber; 2014; Symmetry, 2014, 6(1), pp. 67-88.

21. Automorphic Forms for Triangle Groups.

Charles Doran, Terry Gannon, Hossein Movasati, Khosro Shokri; 2013; Communications in Number Theory and Physics, Volume 7 (2013), Number 4, pp. 689-737.

22. From Polygons to String Theory.

Charles Doran, Ursula Whitcher; 2012; Mathematics Magazine, Volume 85, Number 5, December 2012, pp. 343-360.

23. Lattice Polarized K3 Surfaces and Siegel Modular Forms.

Adrian Clingher, Charles Doran; 2012; Advances in Mathematics, Volume 231, Issue 1, 10 September 2012, Pages 172–212.

24. Codes and Supersymmetry in One Dimension.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber, Robert Miller; 2011; Advances in Theoretical and Mathematical Physics, Volume 15, Number 6 (2011), 1909-1970.

25. Hori-Vafa Mirror Periods, Picard-Fuchs Equations, and Berglund-Hübsch-Krawitz Duality.

Charles Doran, Richard Garavuso; 2011; Journal of High Energy Physics, October 2011, 2011:128.

26. Algebraic K-Theory of Toric Hypersurfaces.

Charles Doran, Matthew Kerr; 2011; Communications in Number Theory and Physics, Vol. 5, No. 2, pp. 397-600.

27. Note on a Geometric Isogeny of K3 Surfaces.

Adrian Clingher, Charles Doran; 2011; International Mathematics Research Notices, 2011 (16): 3657-3687.

28. Closed Form Expressions for Hodge Numbers of Complete Intersection Calabi-Yau Threefolds in Toric Varieties.

Charles Doran, Andrey Novoseltsev; 2010; In *Mirror Symmetry and Tropical Geometry*, Contemporary Mathematics, Vol. 527, pp. 1-14.

29. A Superfield for Every Dash-Chromotopology.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber; 2009; International Journal of Modern Physics A, Vol. 24, Issue 30, pp. 5681-5695.

30. Frames for Supersymmetry.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber; 2009; International Journal of Modern Physics A, Vol. 24, Issue 14 (2009) pp. 2665-2676.

31. Normal Forms, K3 Surface Moduli, and Modular Parametrizations.

Adrian Clingher, Charles Doran, Jacob Lewis, Ursula Whitcher; 2009; In *Groups and Symmetries*, CRM Proceedings and Lecture Notes, 47, 81-98.

32. Super-Zeeman Embedding Models on N-Supersymmetric World-Lines.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber; 2009; Journal of Physics A: Mathematical and Theoretical, Vol. 42. 065402.

33. On the Matter of $N = 2$ Matter.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber; 2008; Physics Letters B, Volume 659, Issues 1-2, 17, Pages 441-446.

34. Numerical Kähler-Einstein Metric on the Third del Pezzo.

Charles Doran, Matthew Headrick, Christopher Herzog, Joshua Kantor, Toby Wiseman; 2008; Communications in Mathematical Physics, Volume 282, Number 2, 357-393.

35. Families of Quintic Calabi-Yau 3-Folds with Discrete Symmetries.

Charles Doran, Brian Greene, Simon Judes; 2008; Communications in Mathematical Physics, Volume 280, Number 2, 675-725.

36. A Counter-Example to a Putative Classification of 1-Dimensional, N-extended Supermultiplets.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber; 2008; Advanced Studies in Theoretical Physics, Vol. 2, no. 3, 99 – 111.

37. Adinkras and the Dynamics of Superspace Prepotentials.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber; 2008; Advanced Studies in Theoretical Physics, Vol. 2, no. 3, 113 - 164.

38. On Stokes Matrices of Calabi-Yau Hypersurfaces.

Charles Doran, Shinobu Hosono; 2007; Advances in Theoretical and Mathematical Physics, 11, Issue 1, 147-174.

39. Algebraic Topology of Calabi-Yau Threefolds in Toric Varieties.

Charles Doran, John Morgan; 2007; Geometry and Topology, 11, 597-642.

40. Crosscaps in Gepner Models and the Moduli Space of T2 Orientifolds.

Brandon Bates, Charles Doran, Koenraad Schalm; 2007; Advances in Theoretical and Mathematical Physics, Volume 11, Number 5, 839-912.

41. Modular Invariants for Lattice Polarized K3 Surfaces.

Adrian Clingher, Charles Doran; 2007; Michigan Mathematical Journal, 55, Issue 2, 355-393.

42. On Graph-Theoretic Identifications of Adinkras, Supersymmetry Representations and Superfields.

Charles Doran, Michael Faux, Jim Gates, Tristan Hübsch, Kevin Iga, Greg Landweber; 2007; International Journal of Modern Physics A, Vol. 22, No. 5, 869-930.

43. On K3 Surfaces with Large Complex Structure.

Adrian Clingher, Charles Doran; 2007; Advances in Mathematics, 215, 504-539.

44. Mirror Symmetry and Integral Variations of Hodge Structure Underlying One Parameter Families of Calabi-Yau Threefolds.

Charles Doran, John Morgan; 2006; In *Mirror Symmetry V*, AMS/IP Studies in Advanced Mathematics, 38, 517-537.

45. A Periodic Table for Supersymmetric M-Theory Orbifolds.

Charles Doran, Michael Faux; 2003; Journal of Mathematical Physics, 44, 2853-2873.

46. Four-Dimensional $N = 1$ Super Yang-Mills Theory from an M-Theory Orbifold.

Charles Doran, Michael Faux, Burt Ovrut; 2003; Advances in Theoretical and Mathematical Physics, 6, 329-355.

47. Intersecting Branes in M-Theory and Chiral Matter in Four Dimensions.

Charles Doran, Michael Faux; 2002; Journal of High Energy Physics, JHEP08, 024.

48. Algebraic and Geometric Isomonodromic Deformations.

Charles Doran; 2001; Journal of Differential Geometry, 59, 33-85.

49. Algebro-geometric Isomonodromic Deformations Linking Hauptmoduls: Variation of the Mirror Map.

Charles Doran; 2001; Centre de Recherches Mathematiques: In *Proceedings on Moonshine and Related Topics*, CRM Proceedings and Lecture Notes, 30, 27-35.

50. Picard-Fuchs Uniformization and Modularity of the Mirror Map.

Charles Doran; 2000; Communications in Mathematical Physics, 212, 625-647.

51. Picard-Fuchs Uniformization: Modularity of the Mirror Map and Mirror-Moonshine.

Charles Doran; 2000; In *The Arithmetic and Geometry of Algebraic Cycles*, CRM Proceedings and Lecture Notes, 24, 257-281.

Books and Book Chapters:**52. *String-Math 2014*.**

Vincent Bouchard, Charles Doran, Stefan Méndez-Diez, Callum Quigley, Eds.; 2016; American Mathematical Society, Proceedings of Symposia in Pure Mathematics 93, 396 pages.

53. *Yau's Work on Moduli, Periods, and Mirror Maps for Calabi-Yau Manifolds*.

Charles Doran; 2010; In "Geometry and Analysis," Volume I. Pages 93-102.

54. *Modular Forms and String Duality*.

Noriko Yui, Helena Verrill, Charles Doran, Eds.; 2008; Fields Institute Communications, 54, 297 pages.

Preprints and Publications in Preparation:**55. *Deformation Theory: An Historical Annotated Bibliography*.**

Charles Doran. 30 pages. Written as Chapter 2 of an unpublished book on Galois deformation theory, coauthored with Siman Wong and based on our notes from a course by Barry Mazur.

56. *Moduli Spaces of K3 Surfaces and Mirror Symmetry for Fano Threefolds*.

Charles Doran, Andrew Harder, Ludmil Katzarkov, Jacob Lewis, Victor Przyjalkowski. 37 pages.

57. *Equivalences of Families of Stacky Toric Calabi-Yau Hypersurfaces*.

Charles Doran, David Favero, Tyler Kelly. 19 pages. arXiv:1503.04888

58. *Calabi-Yau Manifolds Realizing Symplectically Rigid Monodromy Tuples*.

Charles Doran and Andreas Malmendier. 94 pages. arXiv:1503.07500

59. *Geometrization of N-Extended 1-Dimensional Supersymmetry Algebras, II*.

Charles Doran, Kevin Iga, Jordan Kostiuik, Stefan Méndez-Diez. 40 pages. arXiv:1610.09983

60. *Zeta Functions of Alternate Mirror Calabi-Yau Families*.

Charles Doran, Tyler Kelly, Adriana Salerno, Steven Sperber, John Voight, Ursula Whitcher. 25 pages. arXiv:1612.09249

61. *Calabi-Yau Threefolds Fibred by High Rank Lattice Polarized K3 Surfaces*.

Charles Doran, Andrew Harder, Andrey Novoseltsev, Alan Thompson. 31 pages. arXiv:1701.03279

62. *Specialization of Cycles and the K-Theory Elevator*.

Charles Doran, Matt Kerr, James Lewis, Jaya Iyer, Pedro Luis del Angel, Stefan Müller-Stach, Deepam Patel. 43 pages. arXiv:1704.04779

63. *On the Hypergeometric Decomposition of Symmetric K3 Quartic Pencils*.

Charles Doran, Tyler Kelly, Adriana Salerno, Steven Sperber, John Voight, Ursula Whitcher. 62 pages.

64. *K3 Orientifolds*.

Charles Doran, Andreas Malmendier, Stefan Méndez-Diez, Jonathan Rosenberg. 22 pages.

65. *Mirror Symmetry for Lattice Polarized Del Pezzo Surfaces*.

Charles Doran, Alan Thompson. 24 pages. arXiv:1709.00856

66. *Innovative CAS Technology Use in University Mathematics Teaching and Assessment: Findings from a Case Study in Alberta, Canada*.

Daniel Jarvis, Chantal Buteau, Andrey Novoseltsev, Charles Doran. 34 pages.

67. *The Mathematics of Supersymmetry: Graphs, Codes, and Surfaces*.

Charles Doran, Kevin Iga, Ursula Whitcher. Book in preparation for Imperial College/World Scientific.

68. *Superschool on Derived Categories and D-branes*.

Matthew Ballard, Charles Doran, David Favero, Eric Sharpe, Eds. Proceedings in preparation for Springer.

69. *From Supermultiplets to Mirror Symmetry*.

Minako Chinen, Charles Doran, Jordan Kostiuik, Andrew Harder. Paper in preparation.

70. *Supersymmetric Quantum Error Correcting Codes*.

Charles Doran, Jordan Kostiuik, Ethan Ross. Paper in preparation.

71. *Picard-Fuchs, Picard-Vessiot, and Model Theory*.

Charles Doran, Thomas Scanlon. Paper in preparation.

SERVICE: INTERNATIONAL**Advances in Theoretical and Mathematical Physics (ATMP).**

Editor and Managing Editor, 2004-present; Journal Coordinator, 1998-2000.

Issac Newton Institute for Mathematical Sciences (INI).

Co-organizer of the INI scientific program: *K-theory, Algebraic Cycles, and Motivic Homotopy Theory*, January-June 2020.

Pacific Institute for the Mathematical Sciences (PIMS).

Director of the University of Alberta PIMS Site, 2009-2012. Renewed for second term, 2012-2015.

Led department efforts to obtain provincial funding, and initiated two key new programs: the Alberta Postdoctoral Trainee program, which dramatically expanded our quota of PIMS postdoctoral fellows, and the Alberta Summer Mathematics Institute (ASMI).

Mathematical Congress of the Americas 2017, Montréal, Canada.

Co-organizer of Special Sessions: *Motives and Periods* and *Calabi-Yau Manifolds and Calabi-Yau Algebra*.

String-Math 2015 Conference, Sanya, China.

Member, International Organization Committee. Plenary Speaker.

String-Math 2014 Conference, University of Alberta.

Lead conference organizer. Organizer of the satellite workshop, *Calabi-Yau Manifolds and their Moduli*.

GAP (Geometry and Physics) 2014 Workshop.

Co-organizer of the GAP 2014 workshop held at UBC, immediately before the String-Math 2014 Summer School, with the theme *Supersymmetry and Geometry*, May 2014.

PIMS Undergraduate Workshop on Supersymmetry.

Co-organizer of this NSF and PIMS funded event which brought American and Canadian undergraduates to UBC to learn about the *Mathematics of Supersymmetry*. It was scheduled to overlap with the GAP 2014 workshop, May 2014. The event ran again at UBC during August 2016, with funding from both NSF and PIMS.

Australian Mathematical Sciences Institute (AMSI).

Co-organizer of the AMSI-PIMS Workshop, *The Mathematics of Conformal Field Theory*, 2015.

American Institute of Mathematics.

Co-organizer of the Structured Quartet Research Ensemble (SQuaRE) on *Effective Computations in Arithmetic Mirror Symmetry*, 2014 and 2016.

Banff International Research Station (BIRS).

Co-organizer of Focused Research Groups (FRGs): *Effective Computations in Arithmetic Mirror Symmetry*, 2013. *Off-shell Supersymmetry via Graph Theory and Superspace*, 2006.

Co-organizer of workshops: *Modular Forms in String Theory*, 2016. *Hodge Theory and String Dualities*, 2011. *Number Theory and Physics at the Crossroads*, 2011. *Number Theory and Physics at the Crossroads*, 2008. *Modular Forms and String Duality*, 2006.

International Council on Industrial and Applied Mathematics (ICIAM).

Co-organizer of Satellite Workshop at UBC on *Numerical Ricci Flow in Computer Science, Geometry, and Physics*, 2011.

American Mathematical Society (AMS).

Co-organizer of the AMS Special Sessions: *Number Theory and Physics*. South Bend, Indiana, 2010. *K-Theory in M-Theory*. Eugene, Oregon, 2005.

Tsinghua Sanya International Mathematics Forum (TSIMF).

Representative of the Pacific Institute for the Mathematical Sciences and the Banff International Research Station at the TSIMF Inauguration Conference in Sanya, China in December 2010.

University of Vienna. Co-organizer of the workshop, *Homological Mirror Symmetry and Hodge Theory*, 2009.

SERVICE: CANADA**Governor General's Enhancing Global Recognition for Canadian Research Excellence Initiative.**

Reviewer, 2017.

Canadian Western Algebraic Geometry Symposium (CWAGS).

Co-organizer and co-founder of this PIMS and University of Alberta funded event, designed to be the first of a series rotating among universities across Western Canada, October 2017.

Fields Institute, Toronto

Co-organizer of *Modular Forms around String Theory*, the opening workshop of the Fall 2013 Fields Thematic Program on *Calabi-Yau Varieties: Arithmetic, Geometry and Physics*, 2013.

Co-organizer of *Hodge Theory in String Theory*, the closing workshop of the Fall 2013 Fields Thematic Program on *Calabi-Yau Varieties: Arithmetic, Geometry and Physics*, 2013.

Co-organizer of *Arithmetic and Geometry of K3 Surfaces and Calabi-Yau Threefolds*, 2011.

Canadian Mathematical Society (CMS)

Member of CMS Research Committee, 2011-2014.

Co-organizer of CMS Scientific Sessions: *Fibrations, Mirror Symmetry, and Calabi-Yau Geometry*.

Montreal, Quebec, 2015. *Modular Forms and Physics*. Ottawa, Ontario, 2013. *Geometry and Physics*.

Edmonton, Alberta, 2011. *Computational Toric Geometry*. Edmonton, Alberta, 2011.

Canadian Number Theory Association (CNTA) XII Meeting, Lethbridge

Organizer of the workshop, *Number Theory and Physics*, 2012. This was the only independent workshop at the CNTA XII meeting.

University of British Columbia

Member of the Pacific Institute of Theoretical Physics, 2003-2008.

SERVICE: UNIVERSITY**Algebra, Geometry, and Applications (AGA) Area of Excellence**

Group leader for the research and teaching area consisting of 16 faculty, 9 postdoctoral fellows, and 20 graduate students in the Department of Mathematical and Statistical Sciences, University of Alberta, Faculty of Science. 2017-present.

McCalla Professor selection committee

Member, University of Alberta, Faculty of Science. 2014-2015 and 2016-2017.

Theoretical Physics Institute

Member, University of Alberta, Department of Physics. 2010-present

University of Alberta, Department of Mathematical and Statistical Sciences.

Executive Committee, 2009-2015. Outreach Committee, 2014-present.

Appointments Subcommittee for Mathematical Physics: Recruited David Favero, 2013.

Recruited Vincent Bouchard, 2009.

University of Washington, Department of Mathematics. Recruited William Stein, 2006.**Joint Mathematics and Physics String Theory Seminar.**

Co-organizer, University of Washington, Department of Mathematics. 2003-2008.

VIGRE-PIMS Summer School on *K3 Surfaces and String Duality*.

Faculty organizer, University of Washington, 2007.

Western Algebraic Geometry Seminar (WAGS). Co-organizer, University of Washington, 2005 and 2007.**Mathematics and Physics Workshop on Supersymmetry and K-Theory.**

Organizer, University of Washington, 2005.

Mathematical Aspects of Open-Closed String Dualities

Co-organizer of the Pacific Northwest String Seminar (PNSS) two-day international workshop, University of Washington, 2003.

Columbia University. Course head, Introductory Calculus. 2003-2004.**Pennsylvania State University.** Organizer, Center for Geometry and Mathematical Physics Seminar, 2000.

PUBLIC OUTREACH

PIMS Board Meeting.

Invited lecture *String Theory and Mathematics*, 2013.

Folio Magazine: University of Alberta. “Math research could lead to quantum leap in classroom:

Building digital content into the math curriculum,” Text interview with university magazine, 2013.

University of Alberta.

Faculty of Science “Science Matters” Lecture Series, 2011.

University of Alberta, Alberta Summer Mathematics Institute for High School Students (ASMI).

Founding Director, 2010-2016.

Shing-Tung Yau High School Mathematics Awards.

International Scientific Committee, 2011.

University of Washington Science Forum Colloquium.

Public presentation, 2005.

Summer Institute in Mathematics at the University of Washington (SIMUW).

Special Lecturer: *String Theory and Mathematics*, 2005. *Elliptic Curves and Lattice Polytopes*, 2004.

University of Washington.

High School Math Day Lecturer, 2006.

University of Washington.

Special Lecturer: *Why are mathematicians so excited about string theory?* 2003.

Research Science Institute (RSI).

Mathematics Professorial Fellow: 2001, 2003, 2004. Co-founded (with Noam Elkies) and directed Mathematics Internship Program for RSI at Harvard University, 1992.

Stuyvesant High School, NYC.

Supervised two senior projects

POSTDOCTORAL MENTORING

Fenglong You. Sep. 2017-Aug. 2020. U. Alberta: Dept. of Mathematical and Statistical Sciences (with David Favero and Vincent Bouchard). (Ph.D., Ohio State University)

Andrey Novoseltsev. July 2011-April 2016. U. Alberta: Dept. of Mathematical and Statistical Sciences. Currently: Sage Cell maintainer for the US \$700,000 NSF project “Undergraduate Teaching of Mathematics with Open Software and Textbooks.” (Ph.D., University of Alberta)

D. Peter Overholser. Jan. 2014-June 2014. U. Alberta: Dept. of Mathematical and Statistical Sciences (with Emanuel Diaconescu).

Currently: Postdoctoral Researcher, Johannes Gutenberg-Universität Mainz, Institute for Mathematics, Algebraic Geometry Group. (Ph.D., University of California, San Diego)

Alan Thompson. Aug. 2011-June 2014. U. Alberta: Dept. of Mathematical and Statistical Sciences.

Currently: Visiting Fellow at the University of Warwick on secondment from his position as Research Associate at the University of Cambridge. (D.Phil., University of Oxford)

Stefan Méndez-Diez. July 2010-June 2014. U. Alberta: Dept. of Mathematical and Statistical Sciences.

Currently: Visiting Assistant Professor of Mathematics, Bard College. (Ph.D., University of Maryland)

Christopher Marks. July 2010-Dec. 2013. U. Alberta: Dept. of Mathematical and Statistical Sciences (with Terry Gannon)

Currently: Tenure Track Assistant Professor, Department of Mathematics and Statistics, California State University, Chico. (Ph.D., University of California Santa Cruz)

Richard Garavuso. Sep. 2009-Feb. 2012. U. Alberta Dept. of Mathematical and Statistical Sciences
Currently: Tenure Track Assistant Professor, Department of Physical Sciences, Kingsborough Community College, CUNY. (D. Phil., University of Oxford)

Francois-Xavier Machu. Sep. 2009-Aug. 2011. U. Alberta: Dept. of Mathematical and Statistical Sciences
Currently: Tenure Track Assistant Professor at the Mathematical Sciences Center (MSC) of Tsinghua University. (Ph.D., University of Lille)

Aravind Asok. Dec. 2005-June 2008, U. Washington Dept. of Mathematics
Currently: Tenured Associate Professor, Department of Mathematics, University of Southern California. (Ph.D., Princeton University)

Christopher Herzog. Sep. 2005-Aug. 2007. U. Washington Dept. of Physics (with Matthew Strassler)
Currently: Tenured Associate Professor, C.N. Yang Institute for Theoretical Physics, Stony Brook University. (Ph.D., Princeton University)

SUPERVISED GRADUATE STUDENTS (PhD)

Jordan Kostiuk. Current Ph.D. student, U. Alberta: Dept. of Mathematical and Statistical Sciences.
Dissertation: Jordan's Ph.D. dissertation is tentatively entitled: "Geometric Isomonodromic Deformations."
Jordan was awarded an NSERC CGS M Scholarship, 2012-2013, to support his M.Sc. studies;
M.Sc. thesis: "Heegner Points, Hilbert's Twelfth Problem." (see MSc. Students)
Jordan was awarded an NSERC CGS D "Alexander Graham Bell" Scholarship, 2015-2017, as well as the departmental Josephine Mitchell Prize to support his Ph.D. studies.

Andrew Harder. Ph.D. 2016, U. Alberta: Dept. of Mathematical and Statistical Sciences.
Dissertation: "The Geometry of Landau-Ginzburg Models." NSERC PGS D Scholarship (2012-2015)
University of Alberta Faculty of Science Doctoral Dissertation Award (2016).
M.Sc. thesis: "Moduli Spaces of K3 Surfaces with Large Picard Number" (with N. Yui) Queen's University.
First/Present Position: Research Assistant Professor with partial funding through the Simons Collaboration on Homological Mirror Symmetry, University of Miami.

Andrey Novoseltsev. Ph.D. 2011, U. Alberta: Dept. of Mathematical and Statistical Sciences.
Dissertation: "Calabi-Yau Hypersurfaces and Complete Intersections in Toric Varieties"
First position: Postdoctoral Fellow, Department of Mathematical and Statistical Sciences, U. Alberta.
Present position: Sage Cell maintainer for the US \$700,000 NSF project "Undergraduate Teaching of Mathematics with Open Software and Textbooks (see Postdoctoral Mentoring).

Jacob Lewis. Ph.D. 2010, U. Washington, Department of Mathematics.
Dissertation: "Elliptic and K3 Surfaces: Normal Forms, Deformations, and Applications"
First position: NSF International Research Postdoctoral Fellow at the University of Vienna.
Present position: Mathematician at the United States National Security Agency (NSA).

Robert Miller. Ph.D. 2010, U. Washington, Department of Mathematics (with William Stein)
Dissertation: "Empirical Evidence for the Birch and Swinnerton-Dyer Conjecture."
First position: Postdoctoral Fellowship at MSRI.
Present position: Software Engineer at Google.

Ursula Whitcher. Ph.D. 2009, U. Washington, Department of Mathematics.
Dissertation: "Polarized Families of K3 Surfaces."
First position: NSF Teaching and Research Postdoctoral Fellow, Department of Mathematics, Harvey Mudd College.

Present position: Associate Editor, Mathematical Reviews, American Mathematical Society. Ursula recently resigned her tenured Associate Professor position at the University of Wisconsin, Eau Claire.

Simon Judes. Ph.D. 2008, Columbia University, Department of Physics (with Brian Greene).

Dissertation: “Topics in String Theory and Cosmology.”

Present position: Strategy Manager at Winton Group in the UK.

Joshua Kantor. Ph.D. 2008, U. Washington, Department of Mathematics (with Robin Graham).

Dissertation: “Eleven Dimensional Supergravity on Edge Manifolds.”

Present Position: Josh is now doing research in the Lincoln Laboratory at MIT.

Matthew Ballard. Ph.D. 2008, U. Washington, Department of Mathematics.

Dissertation: “Derived Categories of Sheaves of Quasi-Projective Schemes”

First position: NSF-RTG Postdoctoral Research Fellow, Dept. of Math., Univ. of Pennsylvania.

Present position: Tenure Track Assistant Professor, Department of Mathematics, University of South Carolina.

Brandon Bates. Ph.D. 2006, Columbia University, Department of Physics (with Brian Greene)

Dissertation: “Studies in Quantum Geometry.”

Present position: Co-founder and Chief Data Officer at SimpleKYC in New York City.

SUPERVISED GRADUATE STUDENTS (MSc)

James Iverson. Current M.Sc. student, U. Alberta: Dept. of Mathematical and Statistical Sciences. James’ M.Sc. thesis is tentatively entitled: “From Adinkras to Dessins: Supersymmetric Surface Codes.”

Minako Chinen. Current M.Sc. student, U. Alberta: Dept. of Mathematical and Statistical Sciences. Minako’s M.Sc. thesis is tentatively entitled: “Supersymmetric Quiver Algebras.”

Jordan Kostiuk. M.Sc. 2013, U. Alberta: Dept. of Mathematical and Statistical Sciences. M.Sc. thesis: “Heegner Points, Hilbert’s Twelfth Problem, and the Birch and Swinnerton-Dyer Conjecture.”

Jason Wilkes. M.Sc. 2011, U. Alberta: Dept. of Mathematical and Statistical Sciences (with E. Woolgar) M.Sc. thesis: “Numerical Simulation of Ricci Flow on a Class of Manifolds with Non-Essential Minimal Surfaces.” Jason is currently pursuing a Ph.D. in the Department of Psychological and Brain Sciences at the University of California Santa Barbara.

GRADUATE STUDENT ACTIVITIES

Summer School. “Superschool on Derived Categories and D-branes,” July 2016. University of Alberta: Dept. of Mathematical and Statistical Sciences. Co-organizer, with my colleague David Favero and former student, Matthew Ballard, of this week-long Talbot-style workshop in which graduate students and early-career researchers are guided by mentors in Mathematics and Physics.

Graduate Geometry Seminar. “Elliptic Surfaces and Modular Forms,” 2011-2012. University of Alberta: Dept. of Mathematical and Statistical Sciences. Faculty advisor for this seminar featuring lectures by graduate students and postdoctoral fellows designed to bring the students to research-level.

Physics Learning Seminar. “Superseminar,” 2005-2008. University of Washington: Department of Mathematics. Faculty advisor for this graduate-student organized seminar aimed at bridging the gaps in language, background, and perspective between mathematics and physics graduate students.

UNDERGRADUATE STUDENT ADVISING

James Iverson. University of Alberta. “From Adinkras to Dessins: Supersymmetric Surface Codes.”
Ethan Ross. University of Alberta. “Algebraic Geometric and Topological Codes from Supersymmetry.”
Jordan Kostiuk. University of Alberta. “Elliptic Curves and the Birch and Swinnerton-Dyer Conjecture.”
Yuri (Delanghe) Sulyma. University of Alberta. “Computational Toric Geometry,” “Intersection Cohomology and Newton-Okounkov Bodies.”
Josh Shadlen. University of Washington. “Hodge Theory of Calabi-Yau Hypersurfaces.”
Jacob Lewis. Columbia University. “Geodesics Using Mathematica.”
Noah Giansiracusa. University of Washington. “Cubic Surfaces and their Moduli.”
Spencer Greenberg. Columbia University. “Level Sets of Arbitrary Dimension Polynomials with Positive Coefficients and Real Powers.”
Christopher Miller. Columbia University. “The Proof of the Positive Mass Conjecture and its Implications in General Relativity.”
David Kagan. Columbia University. “Anomaly Cancellation in K3 Orbifolds of M-Theory” (with Michael Faux).

COURSE TEACHING

Short Courses:

Calabi-Yau Manifolds, Mirrors, and Moduli, October 2017, Albert-Ludwigs Universität Freiburg.
Lectures on K3 Surfaces, September 2011, Institute of Math. Sciences, Chinese University of Hong Kong.
Periods, Picard-Fuchs Equations, and Calabi-Yau Moduli, August 2011, Fields Institute, Toronto.
Mirror Symmetry and Algebraic Cycles, June 2009, Leibniz Universität Hannover.

Graduate Courses:

Calabi-Yau Geometry, Winter 2014
Computation in Mathematics: Research via Experimentation (with Andrey Novoseltsev), Fall 2013
Geometry and Modular Forms (with Terry Gannon), Fall 2012
Differentiable Manifolds, Fall 2010
Curves and Bundles (with Xavier Machu), Fall 2009
Calabi-Yau Manifolds, Winter 2009/2006
Elliptic Curves and Elliptic Fibrations, Winter 2007
Mirror Symmetry (with Amer Iqbal), Fall 2006
Exceptional Structures in Mathematics (with Henry Cohn), Fall 2005
Hodge Theory, Winter/Spring 2005
Automorphic Forms in Geometry and Physics, Spring 2003
Deformation Theories for Geometry and Number Theory, Spring 2000.

Undergraduate Courses:

Theory of Functions of a Complex Variable, Spring 2016
Geometry, Winter/Fall 2015
Linear Algebra, Winter 2012
Coding Theory, Winter 2010/2013
Differential Equations, Winter 2009
Calculus with Analytical Geometry, Winter 2005/2006/2007/2008
Introductory Calculus, Spring 2001/2002/2004(x2), Fall 2001/2003(x2)
Fourier Analysis, Fall 2002
Differential Geometry, Fall 2000
Introduction to Analysis, Fall 1999
Linear Algebra, Differential Equations, and Calculus courses, 1993-1997