

# CHARLES F. DORAN

Department of Mathematical and Statistical Sciences, 625 Central Academic Building, University of Alberta  
Edmonton, Alberta T6G 2G1 CANADA. E-mail: charles.doran@ualberta.ca

**CITIZENSHIP:** USA (by birth), Canada (naturalized in 2015), Italy (eligible to claim via jure sanguinis)

## 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)

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

Charles Doran, Alan Thompson. To appear in Communications in Number Theory and Physics., Volume 12, Number 3 (2018).

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

Charles Doran, Tyler Kelly, Adriana Salerno, Steven Sperber, John Voight, Ursula Whitcher. To appear in Israel Journal of Mathematics. 41 pages.

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

Charles Doran, Kevin Iga, Jordan Kostiuik, Stefan Méndez-Diez. 40 pages. To appear in Advances in Theoretical and Mathematical Physics, Volume 22, Issue 3 (2018).

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

Charles Doran, David Favero, Tyler Kelly. 19 pages. To appear in Proceedings of the American Mathematical Society. <https://doi.org/10.1090/proc/14154>, August 2018.

**5. Picard-Fuchs Uniformization of Modular Subvarieties.**

Brent Doran, Charles Doran, Andrew Harder; 2018; In *Uniformization, Riemann-Hilbert Correspondence, Calabi-Yau Manifolds, and Picard-Fuchs Equations*. Eds. Lizhen Ji and Shing-Tung Yau. International Press/Higher Education Press. Advanced Lectures in Mathematics, Volume 42, 21-54.

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

Daniel Jarvis, Chantal Buteau, Charles Doran, Andrey Novoseltsev; 2018; Journal of Computers in Mathematics and Science Teaching, 37(4). 34 pages.

**7. Hodge Numbers from Picard-Fuchs Equations.**

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

**8. Off-shell Supersymmetry and Filtered Clifford Supermodules.**

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

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

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

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

Charles Doran, Andrew Harder, Alan Thompson; 2018; In *String-Math 2015*, American Mathematical Society, Proceedings of Symposia in Pure Mathematics, 96, 93-132.

**11. Special Function Identities from Superelliptic Kummer Varieties.**

Adrian Clingher, Charles Doran, Andreas Malmendier; 2017; Asian Journal of Mathematics, Volume 21 (2017) Number 5, 909-952.

**12. An Application of Cubical Cohomology to Adinkras and Supersymmetry Representations.**

Charles Doran, Kevin Iga, Greg Landweber; 2017; Annales de l'Institut Henri Poincaré D: Combinatorics, Physics and their Interactions, Volume 4, Issue 3, 2017, 387-415.

**13. 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.

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

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

**15. 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.

**16. 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.

**17. 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.

**18. 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.

**19. 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.

**20. 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.

**21. 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.

**22. 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.

**23. 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.

**24. 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.

**25. 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.

**26. 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.

**27. From Polygons to String Theory.**

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

**28. Lattice Polarized K3 Surfaces and Siegel Modular Forms.**

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

**29. 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.

**30. 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.

**31. Algebraic K-Theory of Toric Hypersurfaces.**

Charles Doran, Matthew Kerr; 2011; *Commun. Number Theory Phys.*, Vol. 5, No. 2, pp. 397-600.

**32. Note on a Geometric Isogeny of K3 Surfaces.**

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

**33. 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.

**34. 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.

**35. 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.

**36. 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.

**37. 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.

**38. 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.

**39. 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.

**40. 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.

**41. 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.

**42. 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.

**43. On Stokes Matrices of Calabi-Yau Hypersurfaces.**

Charles Doran, Shinobu Hosono; 2007; Adv. Theor. Math. Phys., 11, Issue 1, 147-174.

**44. Algebraic Topology of Calabi-Yau Threefolds in Toric Varieties.**

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

**45. 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.

**46. Modular Invariants for Lattice Polarized K3 Surfaces.**

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

**47. 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.

**48. On K3 Surfaces with Large Complex Structure.**

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

**49. 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.

**50. A Periodic Table for Supersymmetric M-Theory Orbifolds.**

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

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

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

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

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

**53. Algebraic and Geometric Isomonodromic Deformations.**

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



**54. 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.

**55. Picard-Fuchs Uniformization and Modularity of the Mirror Map.**

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

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

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

**Books and Book Chapters:****57. Superschool on Derived Categories and D-branes.**

Matthew Ballard, Charles Doran, David Favero, Eric Sharpe, Eds. To appear in Springer Proceedings in Mathematics & Statistics, Volume 240 (2018).

**58. *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.

**59. 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.

**60. *Modular Forms and String Duality*.**

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

**Preprints and Publications in Preparation:****61. 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.

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

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

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

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

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

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

**65. 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

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

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

**67. K3 Orientifolds.**

Charles Doran, Andreas Malmendier, Stefan Méndez-Diez, Jonathan Rosenberg. 35 pages.

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

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

**69. From Supermultiplets to Mirror Symmetry.**

Minako Chinen, Charles Doran, Jordan Kostiuik. 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****University of Alberta, Faculty of Science.**

Group leader for the Algebra, Geometry, and Applications (AGA) research and teaching area consisting of 16 faculty, 9 postdoctoral fellows, and 20 graduate students in the Department of Mathematical and Statistical Sciences, 2017-present.

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

McCalla Professor committee, 2014-2015 and 2016-2017.

**University of Alberta, Department of Physics.**

Member of the Theoretical Physics Institute, 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.**University of Washington.**

Co-organizer of the UW Joint Mathematics and Physics String Theory Seminar, 2003-2008.

Faculty organizer of the VIGRE-PIMS Summer School on *K3 Surfaces and String Duality*, 2007.

Co-organizer of the Western Algebraic Geometry Seminar (WAGS), 2005 and 2007.

Organizer of the *Mathematics and Physics Workshop on Supersymmetry and K-Theory*, 2005.

Co-organizer of the Pacific Northwest String Seminar (PNSS) two-day international workshop *Mathematical Aspects of Open-Closed String Dualities*, 2003.

**Columbia University.**

Course head for Introductory Calculus. 2003-2004.

**Pennsylvania State University.**

Organizer of the 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: Research Associate at the University of Cambridge. Alan begins a Lectureship at Loughborough University in September 2018. (D.Phil., University of Oxford)

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

Currently: Tenure Track 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.  
First/Present Position: Tammarkin Assistant Professor, Brown University

**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. Andrew begins a tenure-track Assistant Professorship at Lehigh University in January 2019.

**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, Dept. of Math., 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: Tenured Associate 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.** M.Sc. 2018, U. Alberta: Dept. of Mathematical and Statistical Sciences. M.Sc. thesis: "A Geometric and Graphical Study of 1-Dimensional N-Extended Supersymmetry Algebras." Minako starts the Ph.D. program in Pure Mathematics at the University of Alberta in September 2018.

**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