

# Vincent Bouchard | Associate Professor

Rhodes Scholar (Québec and Magdalen, 2001)

Department of Mathematical and Statistical Sciences, University of Alberta  
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## Education

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### University of Oxford, Magdalen College

*D.Phil. Mathematics*

Oxford, UK

2001–2005

### Université de Montréal

*B.Sc. Physics, Excellence, Palmarès de la doyenne, average 4.3/4.3*

Montréal, QC

1998–2001

### Cégep Saint-Jean-sur-Richelieu

*D.E.C. Natural Sciences, Excellence*

Saint-Jean-sur-Richelieu, QC

1996–1998

## D.Phil. thesis

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**Title:** *Toric Geometry and String Theory* [arXiv:hep-th/0609123]

**Supervisor:** Rouse Ball Professor Philip Candelas

## Positions

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### Associate Professor

*Department of Mathematical and Statistical Sciences, University of Alberta*

Edmonton, AB

2013–Present

### Assistant Professor

*Department of Mathematical and Statistical Sciences, University of Alberta*

Edmonton, AB

2009–2013

### Postdoctoral Fellow

*Physics Department, Harvard University*

Cambridge, MA

2007–2009

### NSERC Postdoctoral Fellow

*Perimeter Institute for Theoretical Physics*

Waterloo, ON

2006–2007

### Postdoctoral Fellow

*Mathematical Sciences Research Institute*

Berkeley, CA

2006

"New Topological Structures in Physics" program, January–May

### Postdoctoral Fellow

*Department of Mathematics, University of Pennsylvania*

Philadelphia, PA

2005

Joint math/physics visiting position, September–December

## Research Grants

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**NSERC Discovery Grant:** \$225,000

2013–2018

**NSERC Discovery Grant:** \$130,000

2010–2013

**University of Alberta Research Startup Grant:** \$50,000

2009–2012

## Awards

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Instructor of Distinction Honor Roll	2015
NSERC Postdoctoral Fellowship	2006–2007
MSRI Postdoctoral Fellowship	2006
NSERC PGS Doctoral Scholarship	2004–2005
FCAR Doctoral (B2) Scholarship	2004
Rhodes Scholarship	2001
NSERC PGS Master’s Scholarship	2001–2003
FCAR Master’s (B1) Scholarship	2001
“Forces Avenir” finalist in the <i>Personnalité – 1<sup>er</sup> cycle</i> category	2001
NSERC Undergraduate Student Research Award	2000
As Prime Minister Awards semi-finalist	2000
Université de Montréal Welcome Award	1998
Governor General’s Academic Medal	1996

## Research Interests

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My research program focuses on the fascinating interface between mathematics and physics, more precisely geometry and string theory. In particular, I am interested in using string dualities to uncover new mathematical structures in geometry, such as in mirror symmetry.

## Publications

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### Submitted Publications

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- [1] V. Bouchard, T. Creutzig, D.-E. Diaconescu, C. Doran, C. Quigley, and A. Sheshmani, “Vertical d4-d2-d0 bound states on k3 fibrations and modularity,” arXiv:1601.04030 [hep-th].

### Refereed Publications

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- [2] V. Bouchard, D. Hernandez Serrano, X. Liu, and M. Mulase, “Mirror symmetry for orbifold Hurwitz numbers,” *Journal of Differential Geometry* **98** no. 3, (2014) 375–423, arXiv:1301.4871 [math.AG].
- [3] V. Bouchard and B. Eynard, “Think globally, compute locally,” *JHEP* **1302** (2013) 143, arXiv:1211.2302 [math-ph].
- [4] V. Bouchard, J. Hutchinson, P. Loliencar, M. Meiers, and M. Rupert, “A generalized topological recursion for arbitrary ramification,” *Annales Henri Poincaré* **15** (2014) 143, arXiv:1208.6035 [math-ph].
- [5] V. Bouchard, “Perils and promises of heterotic standard models,” *Can.J.Phys.* **87** (2009) 279–284.
- [6] V. Bouchard, A. Catuneanu, O. Marchal, and P. Sulkowski, “The Remodeling conjecture and the Faber-Pandharipande formula,” *Lett.Math.Phys.* **103** (2013) 59–77, arXiv:1108.2689 [math.AG].
- [7] V. Bouchard and P. Sulkowski, “Topological recursion and mirror curves,” *Adv.Theor.Math.Phys.* **16** (2012) 1443–1483, arXiv:1105.2052 [hep-th].
- [8] V. Bouchard, J. J. Heckman, J. Seo, and C. Vafa, “F-theory and Neutrinos: Kaluza-Klein Dilution of Flavor Hierarchy,” *JHEP* **1001** (2010) 061, arXiv:0904.1419 [hep-ph].

- [9] A. Bak, V. Bouchard, and R. Donagi, "Exploring a new peak in the heterotic landscape," *JHEP* **1006** (2010) 108, arXiv:0811.1242 [hep-th].
- [10] V. Bouchard, A. Klemm, M. Mariño, and S. Pasquetti, "Topological open strings on orbifolds," *Commun.Math.Phys.* **296** (2010) 589–623, arXiv:0807.0597 [hep-th].
- [11] V. Bouchard and R. Donagi, "On heterotic model constraints," *JHEP* **0808** (2008) 060, arXiv:0804.2096 [hep-th].
- [12] V. Bouchard and M. Mariño, *Hurwitz numbers, matrix models and enumerative geometry*, vol. 78 of *Proc.Symp.Pure Math.*, pp. 263–283. AMS, 2008. arXiv:0709.1458 [math.AG].
- [13] V. Bouchard and R. Cavalieri, "On the mathematics and physics of high genus invariants of  $[\mathbb{C}^3/\mathbb{Z}_3]$ ," *Adv.Theor.Math.Phys.* **13** (2009) 695–719, arXiv:0709.3805 [math.AG].
- [14] V. Bouchard, A. Klemm, M. Mariño, and S. Pasquetti, "Remodeling the B-model," *Commun.Math.Phys.* **287** (2009) 117–178, arXiv:0709.1453 [hep-th].
- [15] V. Bouchard and R. Donagi, "On a class of non-simply connected Calabi-Yau threefolds," *Commun.Num.Theor.Phys.* **2** (2008) 1–61, arXiv:0704.3096 [math.AG].
- [16] M. Aganagic, V. Bouchard, and A. Klemm, "Topological Strings and (Almost) Modular Forms," *Commun.Math.Phys.* **277** (2008) 771–819, arXiv:hep-th/0607100 [hep-th].
- [17] V. Bouchard, M. Cvetič, and R. Donagi, "Tri-linear couplings in an heterotic minimal supersymmetric standard model," *Nucl.Phys.* **B745** (2006) 62–83, arXiv:hep-th/0602096 [hep-th].
- [18] V. Bouchard and R. Donagi, "An SU(5) heterotic standard model," *Phys.Lett.* **B633** (2006) 783–791, arXiv:hep-th/0512149 [hep-th].
- [19] V. Bouchard, B. Florea, and M. Mariño, "Topological open string amplitudes on orientifolds," *JHEP* **0502** (2005) 002, arXiv:hep-th/0411227 [hep-th].
- [20] V. Bouchard, B. Florea, and M. Mariño, "Counting higher genus curves with crosscaps in Calabi-Yau orientifolds," *JHEP* **0412** (2004) 035, arXiv:hep-th/0405083 [hep-th].
- [21] V. Bouchard and H. Skarke, "Affine Kac-Moody algebras, CHL strings and the classification of tops," *Adv.Theor.Math.Phys.* **7** (2003) 205–232, arXiv:hep-th/0303218 [hep-th].

### Books.....

- [22] V. Bouchard, C. Doran, S. Mendez-Diez, and C. Quigley, eds., *String-Math 2014*, vol. Proceedings of Symposia in Pure Mathematics. AMS, 2016.

### Non-refereed Publications.....

- [23] V. Bouchard, "Lectures on complex geometry, Calabi-Yau manifolds and toric geometry," in *Proceedings of the Modave Summer School in Mathematical Physics 2005*. Solvay Institute, 2007. arXiv:hep-th/0702063 [hep-th].

### D.Phil. Thesis.....

- [24] V. Bouchard, *Toric Geometry and String Theory*. PhD thesis, Magdalen College, University of Oxford, 2006. arXiv:hep-th/0609123 [hep-th].

## Supervision

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### Postdoctoral Fellows

- Callum Quigley (PIMS Fellow, 2013–2015)
- Alisha Wissanji (2012–2013)
- Olivier Marchal (2011–2012)
- Brendan McLellan (2010–2012)

### NSERC Undergraduate Summer Research

- Nicholas Moore (2015)
- Ahmed Rayyan (2014)
- Jordan Fordyce (2013)
- Joel Hutchinson (2012)
- Michael Meiers (2012)
- Prachi Loliencar (2012)
- Matthew Rupert (2012)
- Andrei Catuneanu (2011)
- Cedric Berndt (2010)

### Teaching Supervision

- Philippe Gaudreau (Graduate Teaching & Learning Program, 2012–2013)

### Graduate Students

- Kento Osuga (PhD, 2015–Present)
- Steve Holman (PhD, 2012–Present)
- Nitin K Chidambaram (MSc, 2015–Present)
- Anand Chotai (MSc, 2014–Present)
- Tyler Dauphinee (MSc, 2014–Present)
- Rosa Paulina Anajao (MSc, 2013–2015)
- Jeffrey Kroll (MSc, 2010–2012)
- Karol Palka (MSc, 2009–2010)

### Undergraduate Research Projects

- Jeffrey Samuelson (MATH 499, Winter 2016)
- Mitchell Taylor (PHYS 499, Fall 2015)
- Krishan Saraswat (PHYS 499, Winter 2015)
- Matthew Moran (Summer 2014)
- Cameron Ruether (MATH 499, Winter 2014)
- Anand Chotai (PHYS 499, Fall 2013)
- Kenny Young (PHYS 499, Fall 2013)
- Ryan Boyce (PHYS 499, Winter 2012)

## Teaching

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- Co-recipient of Blended Learning Awards to redesign Math 114 and Math 115 and create Math 144 and Math 146 using a blended learning and flipped classroom approach.

### 2015–2016

- Math 144 – Calculus for the Physical Sciences (Fall)
- Math 600 – The 1-2-3 of Modular Forms (Fall)
- Math 146 – Calculus for the Physical Sciences II (Winter)
- Math 497 – A First Course in String Theory (Winter)

### 2014–2015

- Math 114 – Calculus for the Physical Sciences (Fall)
- Math 497 – Enumerative Geometry and String Theory (Fall)
- Science 100 (Fall and Winter)
- Math 115 – Calculus for the Physical Sciences II (Winter)

### 2012–2013

- MaPh 468 – Introduction to Relativity (Winter)
- MaPh 451 – Mathematical Methods of Physics (Winter)

### 2013–2014

- Science 100 (Fall and Winter)
- Math 201 – Differential Equations (Winter)

### 2011–2012

- MaPh 451 – Mathematical Methods of Physics (Fall)
- Math 201 – Differential Equations (Fall)
- MaPh 468 – Introduction to Relativity (Winter)

## 2010–2011

- MaPh 343 – Classical Mechanics I (Fall)
- MaPh 468 – Introduction to Relativity (Winter)

## 2009–2010

- MaPh 343 – Classical Mechanics I (Fall)
- MaPh 468 – Introduction to Relativity (Winter)

## Mini-courses

- *Summer 2014 Master Class on Topological Recursion* (with Brad Safnuk), Fields Institute, University of Toronto, 18–22/08/2014
- *Symmetries, Geometry and Physics*, Alberta Summer Mathematics Institute (a summer school for gifted High School students), University of Alberta, Edmonton, AB, Summer 2010 and 2011
- “*Geometerizing*” *particle physics through string theory and F-theory*, Harvey Mudd College, Claremont, CA, 28–30/04/2009
- *Complex geometry, Calabi-Yau manifolds and toric geometry*, Theory Group at CERN, Geneva, Switzerland, 25–31/01/2007
- *Complex geometry, Calabi-Yau manifolds and toric geometry*, Modave School on Mathematical Physics, Modave, Belgium, 19–25/06/2005

## Organizational Activities

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### Workshops and Conferences

Co-organizer for:

- *Quantum Curves and Quantum Knot Invariants* workshop, BIRS, Banff, AB, 15–20/06/2014
- *String-Math 2014* international conference, University of Alberta, Edmonton, AB, 9–13/06/2014
- SQuaRE meeting, American Institute of Mathematics, Palo Alto, CA, 18–22/11/2013
- *Physics around Mirror Symmetry* workshop, Perimeter Institute, Waterloo, ON, 21–25/10/2013
- SQuaRE meeting, American Institute of Mathematics, Palo Alto, CA, 27–31/08/2012
- *New recursion formulae and integrability for Calabi-Yau spaces* workshop, BIRS, Banff, AB, 16–21/10/2011
- *Geometry and Physics* session at the Canadian Mathematical Society Summer Meeting 2011, University of Alberta, Edmonton, AB, 3–5/06/2011
- SQuaRE meeting, American Institute of Mathematics, Palo Alto, CA, 3–7/05/2010
- *A new recursive structure in topological string theory and enumerative geometry* workshop, American Institute of Mathematics, Palo Alto, CA, 8–12/06/2009
- *First Modave School in Mathematical Physics*, Modave, Belgium, 19–25/06/2005

### Seminar Series

Co-organizer for:

- Weekly faculty seminar series aimed primarily at graduate students, University of Alberta, Edmonton, AB, 2013–2015
- *Geometry and Physics* seminars, University of Alberta, Edmonton, AB, 2010–2015

### Research Group

- *PIMS Collaborative Research Group in Geometry and Physics* between University of Alberta and University of British Columbia, 2013–2015

## Professional Service

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### Referee.....

- Refereed papers for: Advances in Mathematics, Advances in Theoretical and Mathematical Physics, Annales Henri Poincaré, Canadian Journal of Physics, Communications in Mathematical Physics, Communications in Number Theory and Physics, Duke Mathematical Journal, Geometry & Topology, Journal of the American Mathematical Society, Journal of Geometry and Physics, Journal of High Energy Physics, Journal of Mathematical Physics, Letters in Mathematical Physics, Mathematical Proceedings of the Cambridge Philosophical Society, Mathematical Research Letters, Nuclear Physics B, Physics Letters B, Selecta Mathematica.
- Member of FQRNT Mathematics grant evaluation committees
- Referee for NSERC Discovery Grants
- External referee for an Early Investigator Grant application at an american university
- External referee for a european grant application

### Review.....

- Reviewer for Mathematical Reviews and MathSciNet
- Review of applications for graduate studies at University of Alberta (2009–Present)

### Outreach.....

- As *PIMS aboriginal coordinator at University of Alberta*, I am involved in Mathematics Outreach initiatives with First Nations around Edmonton, particularly with the Ermineskin Cree Nation. In particular, we are organizing a two-week Math Summer Camp in Ermineskin, which started in the summer 2013 and has now become an annual event.

### Service.....

- Member of Research committee (2014–Present)
- Member of Outreach committee (2014–Present)
- Member of Graduate committee (2014–Present)
- FEC representative for the Faculty of Science at University of Alberta (2014–2016)
- Member of planning committees for the future of Science 100 at University of Alberta (2014–2015)
- Member of Undergraduate Honors committee (2013–2014)
- Member of three hiring committees at University of Alberta (2011–2013)
- Webmaster for the Geometry and Physics Research Group website at University of Alberta, <http://www.math.ualberta.ca/~geophys> (2009–Present)

### Examination Committee.....

- Kasun Hiripitiyage (MSc Mathematics, 08/2015)
- Xiaobai Tan (PhD Mathematics, 08/2014)
- Mark Sebestyen (MSc Mathematics, chair, 09/2013)
- Shima Yahooopour Tari (PhD Physics, 09/2012)
- Andrey Novoseltsev (PhD Mathematics, 05/2011)
- Cole Zmurchok (MSc Mathematics, 08/2014)
- Nelson Knutson (MSc Physics, 09/2013)
- Tyrone Woods (MSc Physics, 08/2011)

### PhD Candidacy Committee.....

- Lawrence Adutwum (Chemistry, 04/2015)
- Tim Graves (Mathematics, 03/2015)
- Valerie Budd (Mathematics, 10/2014)
- Zhihua Chang (Mathematics, 04/2012)
- Eman Aldabbas (Mathematics, 02/2015)
- Xiaobai Tan (Mathematics, 10/2012)
- Aatif Butt (Physics, 09/2011)

- o Cody Holder (Mathematics, 04/2012)

## Affiliations

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Canadian Association of Physicists (member)	2012–Present
Canadian Mathematical Society (member)	2012–Present
Institute of Particle Physics (member)	2012–Present
Perimeter Institute for Theoretical Physics (affiliate member)	2010–Present
Theoretical Physics Institute, University of Alberta (member)	2010–Present

## Talks

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### Mathematics.....

- [1] “A super topological recursion,” January, 2016. Talk given at the *Moduli spaces, integrable systems, and topological recursions* workshop, CRM, Montreal, Canada.
- [2] “Topological recursion and quantum curves,” June, 2015. Talk given at the *Geometric Invariants and Spectral Curves* workshop, Lorentz Center, Leiden, Netherlands.
- [3] “Topological recursion and quantum curves,” February, 2015. *Mathematical Physics Group Seminar*, Utah State University, UT, USA.
- [4] “Why physics is better than math :-),” February, 2015. *Mathematics Colloquium*, Utah State University, UT, USA.
- [5] “Why physics is better than math,” June, 2014. Talk given in the *Summer School in Gromov-Witten Theory*, Pingree Park, Colorado State University, CO, USA.
- [6] “Quantum is airy, but is airy quantum?,” November, 2014. *Geometry and Physics Seminars*, University of Alberta, Edmonton, AB, Canada.
- [7] “Quantum curve for r-airy,” October, 2014. Talk given at the *Quantum curves, Hitchin systems and the Eynard-Orantin theory* at American Institute of Mathematics, Palo Alto, CA, USA.
- [8] “A lot more is known than has been proven,” December, 2014. *Mathematics Colloquium*, California State University at Chico, CA, USA.
- [9] “Quantum curves and Hitchin systems,” March, 2014. Talk given in the *B-model aspects of Gromov-Witten theory* workshop, University of Michigan, Ann Arbor, MI, USA.
- [10] “Quantum curves and Hitchin systems,” February, 2014. String Theory seminars, UC Davis, CA, USA.
- [11] “Quantum curves and topological recursion,” December, 2013. Talk given in the *Modular Forms and Physics* session at the *Canadian Mathematical Society Winter Meeting 2013*, Ottawa, Canada.
- [12] “Classical, quantum and semi-classical,” November, 2013. ThUS seminar, University of Alberta, Edmonton, Canada.
- [13] “Mirror symmetry for orbifold Hurwitz numbers,” August, 2013. Talk given at the *Integrable systems and moduli spaces* workshop, BIRS, Banff, Canada.
- [14] “Mirror symmetry for orbifold Hurwitz numbers,” June, 2013. Talk given at the *String Math 2013* conference, Simons Center for Geometry and Physics, Stony Brook, USA.
- [15] “Mirror symmetry for orbifold Hurwitz numbers,” June, 2013. Talk given at the *Moduli Spaces and their Invariants in Mathematical Physics* workshop, CRM, Université de Montréal, Canada.
- [16] “Mirror symmetry for orbifold Hurwitz numbers,” June, 2013. Talk given at the *Refined invariants in geometry, topology and string theory* workshop, BIRS, Banff, Canada.
- [17] “Topological recursion and double Hurwitz numbers,” December, 2012. Talk given in the *Enumerative Geometry and String Theory* session at the *Canadian Mathematical Society Winter Meeting 2012*, McGill University, Montreal, Canada.
- [18] “Topological recursion and modular forms,” June, 2012. Talk given in the *Special session in number theory and physics* at the *Canadian Number Theory Association XII Meeting*, University of Lethbridge, Canada.

- [19] "The (un)reasonable effectiveness of string theory in mathematics," June, 2012. Talk given in the *Perspectives in Mathematical Physics* session at the *Canadian Mathematical Society Summer Meeting 2012*, University of Regina, Canada.
- [20] "Topological recursion on elliptic curves," February, 2012. *Geometry and Physics Seminar*, University of British Columbia, Vancouver, Canada.
- [21] "A great deal more is known than has been proved," February, 2012. *Mathematics Colloquium*, University of British Columbia, Vancouver, Canada.
- [22] "Topological recursion and mirror curves," July, 2011. Talk given at the *Recent Developments on Orbifolds* workshop, Chern Institute of Mathematics, Tianjin, China.
- [23] "Tops," June, 2011. Talk given in the *Computational toric geometry* session at the *Canadian Mathematical Society Summer Meeting 2011*, University of Alberta, Edmonton, Canada.
- [24] "The geometry of mirror curves," May, 2011. Talk given at the *Number Theory and Physics at the Crossroads* workshop, BIRS, Banff, Canada.
- [25] "A mysterious topological recursion," May, 2011. Talk given at *North-South Dialogue in Mathematics*, Mount Royal University, Calgary, Canada.
- [26] "The geometry of mirror curves," April, 2011. *Mathematical Physics Seminar*, University of Pennsylvania, Philadelphia, USA.
- [27] "The geometry of mirror curves," March, 2011. *Bellingham Algebraic Geometry Seminar*, University of British Columbia, Vancouver, Canada.
- [28] "The geometry of mirror curves," November, 2010. *Geometry and Physics Seminar*, University of Alberta, Edmonton, Canada.
- [29] "The geometry of mirror curves," November, 2010. Talk given at the *Western Algebraic Geometry Symposium*, University of Arizona, Tucson, USA (plenary speaker).
- [30] "Topological recursion and mirror symmetry," May, 2010. *CIRGET Geometry and Topology Seminars*, CIRGET, UQAM, Montréal, Canada.
- [31] "Topological recursion and mirror symmetry," May, 2010. Talk given at the *Connections in Geometry and Physics* conference, Perimeter Institute, Waterloo, Canada (plenary speaker).
- [32] "An algebraic geometry perspective on string phenomenology," April, 2010. *FRAGMENT Seminars*, Colorado State University, Fort Collins, USA.
- [33] "Cut-and-join, mirror symmetry and topological recursion," November, 2009. *Geometry and Physics Seminar*, University of Michigan, Ann Arbor, USA.
- [34] "Topological recursion and Hurwitz numbers," November, 2009. Talk given at the *Workshop on Algebraic Varieties*, Fields Institute, Toronto, Canada.
- [35] "A topological recursion in enumerative geometry," June, 2009. Talk given at *Recursion structures in topological string theory and enumerative geometry* workshop, American Institute of Mathematics, Palo Alto, USA.
- [36] "An algebraic geometry perspective on heterotic string phenomenology," March, 2009. *String Theory Seminars*, UC Davis, USA.
- [37] "New formulae for Gromov-Witten invariants and Hurwitz numbers," March, 2009. *Mathematics Colloquium*, UC Davis, USA.
- [38] "A new recursive structure in enumerative geometry," January, 2009. *Special Seminar*, University of Alberta, Edmonton, Canada.
- [39] "An algebraic geometry perspective on heterotic string phenomenology," November, 2008. *Algebra Seminar*, University of Alberta, Edmonton, Canada.
- [40] "Topological open strings on orbifolds," September, 2008. Talk given at the *Number Theory and Physics at the Crossroads* workshop, BIRS, Banff, Canada.
- [41] "Open B-model on non-compact calabi-yau threefolds," April, 2008. Talk given at *The geometry and integrability of topological QFT and string theory* workshop, Warwick University, UK.
- [42] "Mirror symmetry, matrix models and (open) orbifold Gromov-Witten invariants," March, 2008. *Geometry Seminar*, Boston University, USA.



- [43] "Mirror symmetry, matrix models and enumerative geometry," November, 2007. Talk given at the *Arithmetic and geometry of algebraic varieties, with special emphasis on Calabi-Yau varieties and mirror symmetry* workshop, Fields Institute, Toronto, Canada.
- [44] "Remodeling the B-model: new ideas in enumerative geometry," October, 2007. *Geometry and Physics Seminar*, University of Michigan, Ann Arbor, USA.
- [45] "A new recursive method for solving the B-model," May, 2007. Talk given at the *From tQFT to tt\* and integrability* conference, University of Augsburg, Germany.
- [46] "Orbifold Gromov-Witten invariants and topological strings," March, 2007. *String Theory & Geometry Seminar*, Imperial College, London, UK.
- [47] "On the landscape of standard-model bundles on non-simply connected Calabi-Yau threefolds," December, 2006. Talk given at the *Canadian Mathematical Society Winter Meeting* in the *Calabi-Yau Varieties and Mirror Symmetry* session, Fields Institute, Toronto, Canada.
- [48] "The Standard Model of particle physics: a problem in algebraic geometry," November, 2006. Talk given at the *SACNAS National Conference* in the *Geometry and Theoretical Physics* session, Tampa, USA.
- [49] "Orbifold Gromov-Witten invariants from mirror symmetry," November, 2006. Talk given at the *Workshop on Algebraic Varieties: with special emphasis on Calabi-Yau varieties and mirror symmetry*, Fields Institute, Toronto, Canada.
- [50] "Gromov-Witten invariants, modular forms and topological string theory," September, 2006. *CIRGET Geometry and Topology Seminars*, CIRGET, UQAM, Montréal, Canada.
- [51] "Géométrie énumérative, invariants de Gromov-Witten et théorie des cordes," September, 2006. *CIRGET Junior Seminars*, UQAM, Montréal, Canada.
- [52] "Topological strings, holomorphic anomaly and (almost) modular forms," June, 2006. Talk given at the *Modular Forms and String Duality* workshop, BIRS, Banff, Canada.
- [53] "The Standard Model of particle physics: a problem in algebraic geometry," March, 2006. *Postdoc Seminars*, MSRI, Berkeley, USA.
- [54] "Topological strings on orientifolds," September, 2005. *Math Physics Seminars*, University of Pennsylvania, Philadelphia, USA.
- [55] "Were Gromov-Witten to lose orientation, would they become knots?," February, 2005. *Junior Geometry and Topology Seminars*, University of Oxford, UK.

## Physics.....

- [56] "Quantum is airy, but is airy quantum?," June, 2015. Talk given at the *Theory Canada 2015* conference, University of Calgary, Canada.
- [57] "Quantum curves and topological recursion," October, 2013. Talk given at the *Physics Around Mirror Symmetry* workshop at Perimeter Institute, Waterloo, Canada.
- [58] "Generalized topological recursion and enumerative geometry," October, 2012. *String Theory Seminars*, UC Berkeley, USA.
- [59] "The (un)reasonable effectiveness of string theory in mathematics," June, 2012. Talk given in the *Field Theory and Mathematical Physics* session at the *Canadian Association of Physicists Congress 2012*, University of Calgary, Canada.
- [60] "Gluing pairs of pants," June, 2012. Talk given in the *Quantum gravity and strings* session at *Theory Canada 7*, University of Lethbridge, Canada.
- [61] "Topological recursion on elliptic curves," May, 2012. *High Energy Theory Seminars*, Université de Montréal, Canada.
- [62] "Topological recursion on elliptic curves," May, 2012. *High Energy Theory Seminars*, McGill University, Montreal, Canada.
- [63] "The geometry of mirror curves," November, 2010. *High Energy Theory Seminars*, Caltech, Pasadena, USA.
- [64] "Topological recursion and topological strings," September, 2009. *String Theory Seminars*, AEI Potsdam, Germany.
- [65] "Topological recursion and mirror symmetry," June, 2010. *String Theory Seminars*, University of North Carolina at Chapel Hill, USA.

- [66] "New phenomenological results in string theory," March, 2010. *Theoretical Physics Institute Seminars*, University of Alberta, Edmonton, Canada.
- [67] "F-theory, neutrinos and von E-GUT models," May, 2009. *String Theory Seminars*, Caltech, Pasadena, USA.
- [68] "F-theory, neutrinos and von E-GUT models," March, 2009. *String family lunch talk*, Harvard University, Cambridge, USA.
- [69] "Exploring a new peak in the heterotic landscape," October, 2008. *High Energy Theory Seminars*, McGill University, Montreal, Canada.
- [70] "Perils and promises of heterotic Standard Models (with an all new construction!)," July, 2008. Talk given at the *Simons workshop in Mathematics and Physics 2008*, Simons Center for Geometry and Physics, Stony Brook, USA.
- [71] "The High Country region of the string landscape," June, 2008. Talk given at the *Theory Canada 4* conference, CRM, Université de Montréal, Canada.
- [72] "The High Country region of the string landscape," May, 2008. Talk given at the *String Phenomenology 2008* conference, University of Pennsylvania, Philadelphia, USA (plenary speaker).
- [73] "Modularity of the open topological string," March, 2008. *LPTHE group meeting*, Paris, France.
- [74] "(het)erotic modeling," March, 2008. *String family lunch talk*, Harvard University, Cambridge, USA.
- [75] "Remodeling the B-model: implications for large N duality," December, 2007. Talk given at *Miami 2007: a topical conference on elementary particles, astrophysics and cosmology*, Miami, USA.
- [76] "Remodeling the B-model," October, 2007. *High Energy Theory Seminar*, Texas A&M, College Station, USA.
- [77] "Remodeling the B-model," September, 2007. *String family lunch talk*, Harvard University, Cambridge, USA.
- [78] "Remodeling the B-model," August, 2007. Talk given at the *Simons Workshop in Mathematics and Physics 2007*, Stony Brook University, USA.
- [79] "Can string theory reproduce the standard model of particle physics?," June, 2007. Talk given at the *Canadian Association of Physicists Congress 2007* in the *String Theory and Quantum Gravity* session, University of Saskatchewan, Saskatoon, Canada.
- [80] "Intro to string theory and the MSSM from strings," May, 2007. *Graduate Students Theory Seminar*, Guelph University, Canada.
- [81] "On heterotic standard models," March, 2007. *High Energy Theory Seminars*, DESY, Hamburg, Germany.
- [82] "Orbifold Gromov-Witten invariants and strings," February, 2007. *String journal club*, CERN, Geneva, Switzerland.
- [83] "The Minimal Supersymmetric Standard Model from heterotic string theory," December, 2006. Talk given at *Miami 2006: a topical conference on elementary particles, astrophysics and cosmology*, Miami, USA.
- [84] "Modularity of the topological string wavefunction," November, 2006. *Postdoc Seminars*, Harvard University, Cambridge, USA.
- [85] "Using monodromy to solve the topological string," September, 2006. *String Theory Group Meetings*, Perimeter Institute, Waterloo, Canada.
- [86] "Introduction à la théorie des cordes et le MSSM en théorie des cordes hétérotiques," September, 2006. *High Energy Theory Seminars*, Université de Montréal, Canada.
- [87] "The Minimal Supersymmetric Standard Model from heterotic string theory," September, 2006. *High Energy Theory Seminars*, McGill University, Montreal, Canada.
- [88] "Topological strings on Calabi-Yau orientifolds," May, 2004. *String Theory Seminars*, University of Oxford, UK.

## Outreach and Teaching.....

- [89] "String theory: a giant pool of ideas for mathematics," January, 2016. Public talk at the Physics Observatory, University of Alberta, Canada.
- [90] "Tales from the trenches: Blending and flipping the first-year calculus sequence at university of alberta," November, 2015. Talk given at the *Symposium on Scholarship of Teaching and Learning*, Banff, AB, Canada.
- [91] "Why physics is better than math :-)," August, 2015. Talk given at the *Canadian Undergraduate Mathematics Conference*, University of Alberta, Canada.

- [92] "Blending and flipping the first year calculus sequence," May, 2015. Talk given at the *Faculty of Science Celebration of Excellence*, University of Alberta, Canada.
- [93] "Flipping and blending the first year calculus sequence," May, 2015. Talk given at the *Alberta Mathematics Dialogue 2015*, University of Lethbridge, AB, Canada.