

# Dr. Brett Teeple

Physics researcher and lecturer

## CURRICULUM VITAE

### Academic History

#### University of Toronto Sep 2011 – May 2015

Doctorate of Philosophy continued. Transferred from studies begun at Caltech. PhD received Fall 2015. Research Supervisor: Prof. Erich Poppitz

#### California Institute of Technology Sep 2008 – July 2010

Doctorate of Philosophy (PhD) Theoretical Physics started. Written Qualification exams passed as of June 2009. Master of Science (MS) received June 2011. Research/Independent Study Supervisor: Dr. Sergei Gukov

#### University of Calgary Sep 2005 – May 2008

Bachelor's of Science (B.Sc.). Double Honours Major in Pure Mathematics and Physics. Minor in Applied Mathematics

#### Western Canada High School Sep 2002 – June 2005

Bilingual International Baccalaureate (IB) Diploma.  
Bilingual High School Diploma (French and English)

### Research Experience

#### Research in Extra-dimensional Theories with extra time-like dimensions. Nemalux Company Project & Publications.

Calgary, Canada | Feb 2017 – Present

Project Supervisor: Jode Himann

Research into theories with a specific 6D nature with extra time-like dimensions, in particular three time dimensions with  $SO(3,3)$  symmetry. Applications include a new efficient way to teach mathematics and physics, new algebras and new algebraic methods, extra dimensions are spinorial and timelike via twistor spaces, and many applications to mathematical finance, condensed matter, quasicrystals, chemistry, biology, particle theory and unsolved problems therein as well as in cosmology, grand unified theories in physics, and even applications to linguistics, sociology and politics as well.

Publications coming out:

- 6D Mathematics: Emergent Natural Laws of Physics, Chemistry, Biology, and Social Sciences
- The Search for the Grande Algorithm and the Chained Superorganism
- The Democratic Quality Vector and the New Social Agreement

Several Government grants received including FQXI and IRAP

### Details

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## Research Experience Cont...

### Natural Sciences & Engineering Research Council. Postgraduate Doctoral Fellowship. Research & Thesis, University of Toronto | June 2011 – Aug 2015

Research Advisor: Dr. Erich Poppitz

Topics:

- Towards Explicit Mechanisms of Confinement in 3 and 4-D gauge theories
- Confinement/Deconfinement phase transitions in 3 and 4-D
- Model building Beyond the Standard Model (BSM) with or without supersymmetry
- Dualities in Gauge Theories

Thesis: Deconfinement and Duality of (super) Yang-Mills on toroidially compactified spacetimes for all gauge groups

### Theoretical Physics Research/Independent Study, California Institute of Technology Jan 2009 – July 2010

Research Supervisor: Dr. Sergei Gukov (2009-2010)

Topics:

- Knot Homologies in Classifying 3-D quantum gauge theories and surface operators for 4-D theories
- Readings on Mirror Symmetry & Geometric Langland's Correspondence
- Independent Study on Geometric Renormalization & Motivic Cohomology

### Natural Sciences and Engineering Research Council (NSERC) Undergraduate Research Award (USRA)

Applied Mathematics Summer Research, University of Calgary | May-Aug 2008

Supervisor: Dr. Eugene Couch

- Research in Black Hole Perturbation Equations in Various Spacetimes
- Research in Differential Galois Theory in Solving Differential Equations

Physics Summer Research, University of Toronto | May-Aug 2007

Supervisor: Dr. Robin Marjoribanks

- High-Field Optics, and Ultra-Intense Laser Matter Interaction Group
- High-Order Harmonic Generation from Nickel Velvet Targets (experimental research at ALLS, Advanced Laser Light Source, in Varennes QC: INRS-EMT – l'Institut national de recherche scientifique)
- Theoretical PIC Code Simulations of the Experiment in Collaboration with Theoretical Research Team at École Polytechnique, France. (Patrick Audebert, Jean-Paul Geindre, Anne Heron, Jean-Claude Adam)

Pure Mathematics Summer Research, University of Calgary | May-Aug 2006

Supervisor: Dr. Larry Bates

- Research in the Study of Complex Riemann Surfaces
- Proofs of Cases in Abel's General Curve Theorem

## Awards

### NSERC Post-graduate Doctoral Fellowship 2009-2013

### Canadian Association of Physicists (CAP)

- Second Place Undergraduate Prize Exam 2007
- Seventh Place Undergraduate Prize Exam 2006
- Ninth Place Undergraduate Prize Exam 2008. (National rankings on theoretical competition out of competitors from over 27 universities.)

### Gov of Germany Prize

- For highest grade in all first year German courses UCalgary 2008

### Selection for 36<sup>th</sup> International Physics Olympiad

Salamanca, Spain | 2005

- Top 5 Physics Students from each of over 80 different countries selected for intense Theoretical and Experimental Competitions. Selection based on:
- Third Place CAP High School Prize Exam, including First in Alberta
- Selecte from thousands of Canadian High School competitors to participate in National Olympiad Finals in Toronto in both 2004 and 2005, where national finalists compete

### Dean's List

- 2005 – 2006 – 2007 – 2008

## Teaching Experience

### University of Toronto

- Physics 224 (Fall 2012) and 324 (Winter 2014): Practical Physics I/II & computational physics demonstrator and grader
- Condensed Matter Physics (Fall 2014) Grader
- Advanced Physics Labs (Fall 2014 and Winter 2015): Lab Demonstrator
- Physics 1500: Graduate Statistical Mechanics (Fall 2011, 2012, 2013, 2014)
- TA, tutorial leader, problem set designer and grader with Profs. Sajeev John (2011), Hae-Young Kee (2012-2013) and Sidartha Goyal (2014)
- Physics 180 (Fall 2015) Elements of Physics for Engineers
- TA, tutorial leader, problem set, quiz and solution design, grader with Prof. Joseph Thywissen
- Physics 131: Introduction to Physics 1 (Fall 2011)
- Practicals and Tutorial Lecturer and Instructor, Marker
- POPTOR physics Olympiad trainer and instructor (2012-2014)
- Canadian Association of Physicists University Prize Exam Grader (Winter 2016)
- Graded Nationwide Undergraduate Prize Exams from dozens of universities across Canada

### California Institute of Technology

- Physics 8b and c: Electromagnetism Laboratory (Winter & Spring 2009)
- Help Lab Teaching Assistant, Tutorial Instructor and Grader
- TA with Dr. David Politzer
- Physics 5 and 105: Graduate and Sophomore Electronics Lab (Fall 2009)
- Laboratory Design, and Tutorial Instructor
- Grader and Lab Assistant

### Ryerson University

- Private tutor for over 4 courses including multimedia, Electronics I and II, Electrical Engineering, and Software Engineering

### University of Calgary

- Private tutor for over 8 courses
- Instructor for Canadian Association of Physicists University Prize Exam (Winter 2019)

### Olympiads School

- Lecturer of University Mechanics, Thermodynamics, Electrodynamics, and Optics for the top ten High School students in Canada competing in the National and International Physics Olympiads (Fall 2016 – present)
- Instructor of Canadian and American Competitions and Examinations of both Nation's brightest students
- Instructor of CAYPT and IYPT (International Young Physicists' Tournament) (Fall 2016 – Winter 2018)
- Students of mine made it to Israel for the International Olympiad this July 2019, and Portugal in 2018, as well as the IYPT in Beijing in 2018, and in Singapore in 2017

## Scholarships

### Physics Blythe Fellowship 2013-2014

- for novel research in theoretical physics

### NSERC PGS-D Graduate Scholarship 2008-2012

### Board of Governor's Tuition & Fees Scholarship Jan 2008

### 25<sup>th</sup> Anniversary Scholarship in Mathematics & Statistics

- Selected twice in both Sep 2006 & Sep 2007
- Outstanding student of pure mathematics

### O. George Fritz Scholarship Sep 2007

- Outstanding fourth year physics student

### Louise McKinney Scholarship Feb 2007 & Feb 2008

- Academic merit

### Bob Grainger Undergraduate Bursary Feb 2007

### Alexander Rutherford Scholarship Sep 2005

- Academic merit

### University of Calgary May 2005

- Entrance (*Merit Award*)
- Math Extension Program Prize (*First in First Year Calculus Course Challenge Exams*)

Aug 2005

- International Baccalaureate Entrance Scholarship

### Dean's Academic Merit Admission Award May 2005

## Publications

### **Deconfinement on $R^2 \times S^1 \times S^1$ for all gauge groups and duality to double Coulomb gas**

- Brett Teeple (University of Toronto) Published in JHEP April 2016
- Teeple, B. J. High Energ. Phys. (2016) 2016: 109. [https://doi.org/10.1007/JHEP04\(2016\)109](https://doi.org/10.1007/JHEP04(2016)109)

### **Deconfinement and continuity between thermal and (super) Yang-Mills theory for all gauge groups**

- Mohamed M. Anber, Erich Poppitz, Brett Teeple (University of Toronto) Published in JHEP June 2014 <http://arxiv.org/abs/1406.1199>

### **Deconfinement on $R^2 \times S^1 \times S^1$ for all gauge groups and duality to double Coulomb gas and 'affine' XY model**

- Brett Teeple (University of Toronto) Submitted to JHEP June 2015
- <http://export.arxiv.org/abs/1506.02110>

### **Deconfinement and Duality of (super) Yang-Mills on toroidially compactified spacetimes for all gauge groups**

- Brett Teeple (University of Toronto) Thesis June 2015

### **Deconfinement in $N=1$ super Yang-Mills theory on $R^3 \times S^1$ via dual-Coulomb gas and "affine" XY-model**

- Mohamed M. Anber, Scott Collier, Erich Poppitz, Seth Strimas-Mackey, Brett Teeple (University of Toronto)
- Published in JHEP November 2013
- <http://link.springer.com/article/10.1007/JHEP11%282013%29142>

**Several Talks presented on these works...**

## Seminars, Presentations and Colloquia

### **Deconfinement and continuity between super and thermal Yang-Mills theory for all gauge groups**

Brett Teeple, University of Toronto Theoretical High Energy Physics seminar  
March 2015

### **Phase transitions in QCD and QCD-like theories**

Brett Teeple, University of Toronto Summer Colloquium 2014

### **Coherent and incoherent radiation from ultra-intense laser interaction with nanostructured nickel nanowire ('velvet') targets**

- Robin Marjoribanks, Marina Servol, Paul Forrester, Hart Levy, Luke McKinney,
- Brett Teeple, Yves Candela (University of Toronto)
- Jean-Claude Kieffer (INRS-EMT)
- Simon Le Moal, Gabor Kulcsar, John Sipe (University of Toronto)
- Patrick Audebert, Jean-Paul Geindre (LULI, CEA/CNRS/Ecole Polytechnique)
- Anne Heron, Jean-Claude Adam (CPhT, CEA/CNRS/Ecole Polytechnique)

Abstract Submitted for Oral Presentation to the 49th Annual Meeting of the Division of Plasma Physics. Orlando, Florida | Nov 12–16, 2007

### **Theory and Experiment in ultra intense laser-matter interaction with nanostructures Ni-nanowire targets**

- Robin Marjoribanks, Marina Servol, Paul Forrester, Hart Levy, Luke McKinney,
- Brett Teeple, Yves Candela, Ludovic Lecherbourg (University of Toronto)
- Jean-Claude Kieffer (INRS-EMT)
- Simon Le Moal, Gabor Kulcsar, John Sipe (University of Toronto)
- Patrick Audebert, Jean-Paul Geindre (LULI, CEA/CNRS/Ecole Polytechnique)
- Anne Heron, Jean-Claude Adam (CPhT, CEA/CNRS/Ecole Polytechnique)

### **Refereed Oral Presentation to the Conference on Lasers and Electro-Optics (CLEO) and the Quantum Electronics and Laser Science Conference (QELS)**

San Jose CA | May 2008

### **Ultra-Intense 35fs Laser-Matter Interaction Physics in Nanostructured Ni-Nanowire Targets** Rochester, NY | October 19-23 2008

- Robin S. Marjoribanks, Ludovic Lecherbourg, Patrick Audebert, Jean-Paul Geindre Brett Teeple, Marina Servol, Anne Héron, Jean-Claude Adam, Gabor Kulcsár, John Sipe, Paul Forrester, Jean-Claude Kieffer, Luke McKinney, Simon Le Moal, Hart Levy
- Refereed Oral Presentation for Frontiers in Optics, Laser Science XXIV – American Physical Society Annual Meeting

## Seminars, Presentations and Colloquia Cont...

### **Towards Confinement in 3D: Deformation, Duality, Decompactification**

- Brett Teeple
- Oral Presentation for PhD Interview at Universiteit van Amsterdam
- June 2011, Amsterdam, Netherlands.

### **High Harmonic Generation in Gases: Applications to Electron Orbital Tomography and Attosecond Dynamics**

- Brett Teeple
- Oral Presentation for the Canadian Undergraduate Physics Conference (CUPC), October 2007, Vancouver BC.

### **Differential Galois Theory and its Application to Black Hole Perturbations**

- Brett Teeple
- Oral Presentation for the Canadian Undergraduate Mathematics Conference (CUMC), July 2008, Toronto, ON.

## Advanced Coursework and Schools

### **Jerusalem Winter School of Theoretical Physics: Particle Theory and Cosmology** Dec. 27, 2011 – Jan. 5, 2012

### **Caltech Advanced Coursework** 2009-2010

- Neural Computation
  - Term Paper: Path Integral Methods in Exact Solutions of Learning and Decision Models. Grade: A
- String Theory (3 courses)
- Quantum Field Theory (3 courses)
  - Term Project: Instantons and Theta Vacua
- Advanced Mathematical Methods (3 courses)
- Advanced Particle Theory (topological, beyond standard model, and supersymmetry). Grade: A
  - Term Presentation: Instantons in Supersymmetry Breaking
- Many others... + Passed PhD Written Qualifying Exams

### **Atlantic Association for Research in the Mathematical Sciences**

University of New Brunswick

July 2008

- Representation Theory of Algebras (Grade Received: A)
- Mathematical Finance (Grade Received: A)
  - Term Paper and Presentation: Path Integral Methods in the Pricing of Exotic Options

July 2009

- Quantum Information Theory (Grade: A)
- Algebraic Combinatorics (Grade: A-)
  - Term Paper and Presentation: Discrete Morse Theory with Applications to Theoretical Physics

## References

### **Prof. Erich Poppitz**

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