

# Matthew Burke

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## Academic Employment

- **University of Calgary, Canada**  
Postdoctoral Scholar in the Department of Mathematics and Statistics, 2017.09-Present.  
Supervisor: Kristine Bauer.
- **Masaryk University, Brno, Czech Republic**  
Visiting Postdoctoral Researcher in the Department of Mathematics and Statistics, 2015.10-11.

## Education

- **Macquarie University, Sydney**  
PhD Mathematics, 2011-2015.  
Thesis: Synthetic Lie Theory.  
Supervisor: Richard Garner. Co-supervisor: Dominic Verity.
- **Christ's College, University of Cambridge**  
Part III Mathematics (MMath), 2010-2011.  
Pass with Merit.  
Part III Essay scored 95/100.
- **Christ's College, University of Cambridge**  
Bachelor's Degree in Mathematics (BA), 2007-2010.  
Upper Second Class Honours.  
Completed seven optional computational projects all of which gained alpha quality marks.  
Christ's College Whelan Prize in 2008 for First Class Examination Performance

## Publications and Preprints

- The Algebroid of a Groupoid in a Tangent Category, *preprint*, 2017.11.28. Available at <https://arxiv.org/abs/1711.09328>.
- A Synthetic Version of Lie's Second Theorem, *accepted in Applied Categorical Structures pending corrections*, 2017.09.18. Available at <https://arxiv.org/abs/1605.06378>.
- Connected Lie Groupoids are Internally Connected and Integral Complete in Synthetic Differential Geometry, *Symmetry, Integrability and Geometry: Methods and Applications*, 2016.06.29. Available at <http://www.emis.de/journals/SIGMA/2017/007/>.

## Teaching and Work Experience

2017.09-Present	<b>Sessional Instructor at the University of Calgary</b> Lectured Mathematics 249 in the Department of Mathematics and Statistics.
2016.11-2017.08	<b>Chief Technology Officer at MathSpire Ltd.</b> Extended existing course structure and developed new courses, interactive mathematics lessons and tests for A-level mathematics students. Used F#, C#, SQL, JavaScript, ASP.NET and the Xamarin Framework to create cross platform mobile applications, desktop applications and an integrated web API.
2016.07-08	<b>Tutor at Debate Chamber Mathematics Summer School</b> Guided A-level students through undergraduate level mathematics topics including Linear Algebra, Analysis, Differential Equations, Turing Machines, Infinity and Cryptography.
2016.06-2016.11	<b>Software Developer and Content Creator at MathSpire Ltd.</b> Created database of mathematics videos, tests and graphics using F# and SQL.
2013-2014	<b>Tutor for Macquarie University</b> Demonstrated solutions on the whiteboard for three undergraduate mathematics courses and provided additional individual assistance.
2012	<b>Tutor at Macquarie University Numeracy Centre</b> Guided and motivated first year students individually and in small groups at the drop-in centre.
2010.06	<b>GCSE Tutor for Blue Tutors</b>

## Talks and Conferences

- Calgary Peripatetic Seminar in Logic and Category Theory, *Sites of Smooth Affine Schemes: Part III*, University of Calgary, 2017.10.13.
- Calgary Peripatetic Seminar in Logic and Category Theory, *Sites of Smooth Affine Schemes: Part II*, University of Calgary, 2017.10.06.
- Calgary Peripatetic Seminar in Logic and Category Theory, *Sites of Smooth Affine Schemes*, University of Calgary, 2017.09.22.
- Calgary Peripatetic Seminar in Logic and Category Theory, *Lie's Third Theorem using an Intuitionistic Double Negation*, University of Calgary, 2017.09.06.
- Category Theory Seminar, *Lie's Third Theorem in Synthetic Differential Geometry*, University of Cambridge, 2017.04.02.
- Calgary Mathematics Department Colloquium, *Infinitesimals in Lie Theory*, University of Calgary, 2016.10.07.
- Calgary Peripatetic Seminar in Logic and Category Theory, *Lie Theory for Categories using Infinitesimals*, University of Calgary, 2016.09.30.
- Category Theory Seminar, *A Synthetic Version of Lie's Second Theorem*, University of Cambridge, 2015.11.17.
- Seminaire de geometrie et physique mathematique, *Multi-object Lie theory using synthetic differential geometry*, Universite Paris Diderot, Paris 7, 2015.12.04.
- Algebra Seminar, *Lie's Second Theorem*, Masaryk University, Brno, 2015.11.05.
- Algebra Seminar, *Jet Part of a Category*, Masaryk University, Brno, 2015.10.28.

- Differential Geometry Seminar, *An Introduction to Synthetic Differential Geometry*, Masaryk University, Brno, 2015.10.26.
- Plenary Speaker at Eduard Čech Institute Workshop, *Synthetic Lie Theory*, Trest, Czech Republic, 2015.10.10.
- Centre of Australian Category Theory, *Jet Categories in the Cahiers Topos (2 talks)*, Macquarie University, 2015.05.13ff.
- Category Theory 2014, *Synthetic Lie Theory*, University of Cambridge, 2014.07.04.
- MCDC 2014, *A Synthetic Perspective on the Integrability of Lie Algebroids*, Macquarie University, 2014.06.19.
- Centre of Australian Category Theory, *A Synthetic Perspective on the Integrability of Lie Algebroids (3 talks)*, Macquarie University, 2014.05.21ff.
- MCDC 2013, *Cohomology from the Perspective of Restriction Categories and Atlases*, Macquarie University, 2013.07.04.
- MCDC 2012, *Applications of Logic in Differential Geometry*, Macquarie University, 2012.06.15.
- Part III talk, *Synthetic Differential Geometry*, University of Cambridge, 2011.