

# David Carchedi

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## Research Interests

- Applications of higher category theory to topology and geometry
- Derived geometry, derived manifolds, and differential graded supergeometry
- Topological field theories
- Higher topos theory

## Employment

- 2015–Present **Assistant Professor**, *George Mason University*, Fairfax, VA, USA.
- 2014–2015 **Postdoc**, *University of British Columbia*, Vancouver, Canada.
- 2011–2014 **Postdoc**, *Max Planck Institute for Mathematics (MPI)*, Bonn, Germany.

## Education

- 2007–2011 **Ph.D. in Pure Mathematics**, *Utrecht University*, The Netherlands.
- THESIS
- Categorical Properties of Topological and Differentiable Stacks
- adviser Ieke Moerdijk
- 2006–2007 **Master Class in “Symplectic Geometry and Beyond”**, *Mathematical Research Institute*, The Netherlands.
- THESIS
- title *Path Groupoids as an Exponent for Smooth Étendue*.
- adviser Ieke Moerdijk
- 2004–2008 **M.Sc. Pure Mathematics**, *Purdue University*, West Lafayette, IN, USA.

Fall of 2002 **“Math in Moscow” program**, *Independent University of Moscow*, Moscow, Russia.

2000–2004 **B.Sc. Mathematics**, *Worcester Polytechnic Institute*, Worcester, MA, USA.

2000–2004 **B.Sc. Physics**, *Worcester Polytechnic Institute*, Worcester, MA, USA.

— UNDERGRADUATE THESIS (For both majors)

title *Gravitational Fields of Azimuthally Symmetric Bodies in General Relativity*

math adviser Mayer Humi

physics adviser Lok C. Lew Yan Voon

adviser

## Publications

- 1) Carchedi, D. Compactly Generated Stacks: A Cartesian Closed Theory of Topological Stacks.  
*Advances of Mathematics*, Volume 229, Issue 6, April 1 2012, Pages 3339–3397.
- 2) Carchedi, D. An Étale Space Construction for Stacks.  
*Journal of Algebraic and Geometric Topology*, Volume 13, Issue 2, Pages 831-903.
- 3) Carchedi, D. and Roytenberg, D. On Theories of Superalgebras of Differentiable Functions  
*Theory and Applications of Categories* Vol. 28, 2013, No. 30, pp 1022-1098.
- 4) Carchedi, D. Erratum: “An Étale Space Construction for Stacks”.  
*Journal of Algebraic and Geometric Topology* Volume 16, Issue 1, Pages 541–546.
- 5) Carchedi, D. On the homotopy type of higher orbifolds and Haefliger classifying spaces  
*Advances of Mathematics*, Volume 294, 2016, Pages 756–818.

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## Pre-prints

- 1) Carchedi, D. Sheaf Theory for Étale Geometric Stacks<sup>1</sup>  
arxiv.org/abs/1011.6070 (2010) (74 pages)
- 2) Carchedi, D. Étale Stacks as Prolongations  
arxiv.org/abs/1212.2282 (2012) (65 pages)
- 3) Carchedi, D. and Roytenberg, D. Homological Algebra for Superalgebras of Differentiable Functions arxiv.org/abs/1212.3745 (2012) (62 pages)
- 4) Carchedi, D. Higher Orbifolds and Deligne-Mumford Stacks as Structured Infinity Topoi  
http://arxiv.org/abs/1312.2204 (2013) (121 pages)
- 5) Carchedi, D. Scherotzke S., Sibilla, N., and Talpo, M. Kato-Nakayama spaces, infinite root stacks, and the profinite homotopy type of log schemes.  
arxiv.org/abs/1511.00037 (2015) (57 pages)
- 6) Carchedi, D. Étale homotopy types of higher stacks. arxiv.org/abs/1511.07830 (2015) (60 pages)

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## Refereeing

I have refereed papers for:

- Memoirs of the AMS
- Geometry & Topology
- Advances of Mathematics
- Mathematische Zeitschrift

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## Visiting Positions

- Jun.-Aug. **Visiting Scientist**, *Max Planck Institute for Mathematics*.  
2016
- Jan.- May **Visiting Scholar**, *University of California, Berkeley*.  
2014
- Summer **Visiting Scholar (Topology Group)**, *Massachusetts Institute of Technology*.  
2013
- Summer **Visiting Scholar (Topology Group)**, *Massachusetts Institute of Technology*.  
2012
- Summer **Visiting Scholar (Topology Group)**, *Massachusetts Institute of Technology*.  
2010
- Summer **Visiting Scholar (Topology Group)**, *Massachusetts Institute of Technology*.  
2009

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<sup>1</sup>There is some overlap of material between this preprint and the results of *An Étale Space Construction for Stacks* and *Étale Stacks as Prolongations* however the method of proof in the latter is quite different.

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## Teaching Experience

- 2016 George Mason University  
Category Theory (graduate).
- 2016 George Mason University  
Topology (graduate).
- 2015 George Mason University  
Abstract Algebra (undergraduate).
- 2015 University of British Columbia  
Calculus II: Integration and series.
- 2013 University of Bonn.  
Topos Theory (graduate).
- 2013 MPI  
Taught a mini-course entitled “A Differential Graded Approach to Derived Differential Geometry.”
- Utrecht Teaching Assistant (TA) for Linear Algebra (Fall 2007, Fall University 2010), Vector Calculus (Fall 2007), Differentiable Manifolds (Master course) (Spring 2008), Group Theory (Fall 2008, Fall 2009), Real Analysis (Spring 2009), Multivariable Real Analysis (Spring 2010), Functions and Series (Fall 2010).
- GEX Inc. Content designer for educational mathematics software accompanying college calculus textbooks (Summer 2006)
- Purdue Teaching Assistant (TA) for Integral Calculus for Engineers University (Fall 2005) and Taylor Series for Engineers (Spring 2006)
- Norwood Substitute Math Teacher (during undergraduate breaks) High School

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## Seminars Organized

- Spring 2012- Co-organizer of the “Higher Differential Geometry” seminar  
Summer at the MPI, together with Christian Blohmann and Peter  
2014 Teichner.

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## Advising Experience

- 2011 Utrecht University  
Joint supervision of Camilo Angulo’s master class thesis, together with Ieke Moerdijk.

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## Conference and Workshop Talks

- June 2016 **Contributed Talk**,  
“Dg-manifolds as derived manifolds. ” **GAP XIV: Graded geometry and applications to physics**,  
University of Sheffield, UK
- June 2016 **Invited Speaker**,  
“Étale homotopy types of higher stacks” **Higher structures in geometry and physics**,  
University of Melbourne, Creswick campus MATRIX center, Australia
- October 2014 **Invited Speaker**,  
“Dg-manifolds as derived manifolds” **Higher Structures in Geometry and Physics 2014**,  
University of Geneva, Switzerland
- October 2014 **Invited Speaker**,  
“Dg-manifolds as derived manifolds” **AMS Western Sectional Meeting, Special Session on Homotopy Theory**,  
San Francisco State University, San Francisco, CA
- March 2014 **Invited Speaker**,  
“A differential graded approach to derived manifolds” **Geometry, Topology and Physics Workshop**,  
University of Pittsburgh, PA, USA
- October 2013 **Invited Speaker**,  
“Dg-supermanifolds as derived supermanifolds” **String Geometry Meeting**,  
MPI, Bonn, Germany
- January 2012 **Invited Speaker**,  
“Sheaf theory for étale stacks”,  
**Higher Structures Along the Lower Rhine I**,  
MPI, Bonn, Germany
- June 2009 **Invited Speaker**,  
“Compactly Generated Stacks”,  
**Link to Notes: Compactly Generated Stacks, CRCG Workshop - Higher Structures in Topology and Geometry III**,  
Göttingen, Germany
- May 2009 “Introduction to Topological Stacks”  
“Compactly Generated Stacks”,  
**Topology in the Swiss Alps**,  
Le Châtelard, Switzerland

- May 2008 “Lie Groupoids, Smooth Stacks, and Foliation Theory”,  
**Topology in the Swiss Alps**,  
 Le Châtelard, Switzerland
- April 2008 “Foliations and Mapping Stacks of Groupoids”,  
**Workshop on Topological and Differentiable Stacks**,  
 CRM, Bellaterra, Spain
- April 2003 “Lie Groups and Quantum Mechanics”  
 “Representation Theory’s ‘Toughest’ Theorem”,  
**Hudson River Undergraduate Mathematics Conference**,  
 Union College, NY, USA
- April 2002 “Pythagorean Triplets”,  
**Hudson River Undergraduate Mathematics Conference**,  
 Hamilton College, NY, USA

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### Invited Seminar Talks

- September 2016 “A new approach to étale homotopy theory”,  
**Algebra-Number Theory Seminar, University of Maryland**
- April 2016 “A new approach to étale homotopy theory”,  
**Topology Seminar, University of Illinois at Urbana-Champaign**
- August 2014 “Dg-manifolds as derived manifolds”,  
**MPI-Oberseminar**
- September 2013 “A Differential Graded Approach to Derived Manifolds”,  
**Topology Seminar, Massachusetts Institute of Technology**
- September 2013 “A Differential Graded Approach to Derived Manifolds”,  
**Topology Seminar, University of Illinois at Urbana-Champaign**
- September 2013 “A Differential Graded Approach to Derived Manifolds”,  
**Topology Seminar, University of California, Berkeley**
- March 2013 “A Differential Graded Approach to Derived Differential Geometry”,  
**Utrecht University**
- April 2012 “Sheaf Theory for Étale Differentiable Stacks and Foliation Theory”,  
**Sapienza Università di Roma**

- September 2010 “Compactly Generated Stacks”,  
**Massachusetts Institute of Technology**
- August 2010 “Compactly Generated Stacks”,  
**University of Chicago**
- July 2010 “Compactly Generated Stacks”,  
**University of California, Riverside**

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## Seminar Talks

- 2016 **Higher Differential Geometry, MPI**  
 A new approach to étale homotopy theory
- 2015 **Topology, Algebra, and Dynamics Seminar, George Mason**  
 A new approach to étale homotopy theory
- 2015 **Combinatorics, Algebra, and Geometry Seminar, George Mason**  
 Differential graded manifolds as a model for derived manifolds
- 2014 **UBC Topology Seminar**  
 Differentiable Stacks and Foliation Theory Part II
- 2014 **UBC Topology Seminar**  
 Differentiable Stacks and Foliation Theory Part I
- 2014 **Seminar on Factorization Algebras**  
 The Factorization Condition
- 2013 **Graduate Student Seminar on Higher Categories II**  
 The Unicity Theorem for  $(\infty, n)$ -categories.
- 2013 **Graduate Student Seminar on Higher Categories I**  
 The Homotopy Hypothesis.
- Summer 2012 **Higher Differential Geometry Seminar**  
 Algebraic Theories and Super  $C^\infty$ -rings.
- Spring 2012 **Goodwillie Calculus**  
 Homogeneous functors and cross-effects
- 2009-2010 **Model Categories and Higher Topos Theory**
  - Bergner’s model structure on simplicial categories,
  - The covariant model structure and the  $\infty$ -Grothendieck construction,
  - Left-exact localizations and  $\infty$ -topoi

Spring 2009 **Seminar on Calabi-Yau Geometry and Mirror Symmetry**

- A combinatorial model for the canonical bundle of a smooth toric variety,
- Canonical divisors, complex vector bundles, and the Adjunction Formula

Spring 2009 **Operads and Iterative Loop Spaces**

- Geometric realization of simplicial spaces,
- Proof of the recognition principle for iterative loop spaces

Spring 2009 **Higher Operads, Higher Categories**

- Multicategories and their algebras,
- Generalized endomorphism multicategories, free  $T$ -multicategories, opetopes, and structured categories.

Fall 2008 **“Friday Fish”** (Seminar on Poisson Geometry)

- Poisson Structures,
- Symplectic groupoids and the integration of Poisson Lie algebroids

Fall 2008 **Stable Homotopy Theory**

Eilenberg-MacLane spectra, Brown’s representation theorem,  $K$ -theory, and connective spectra

Spring 2008 **Twisted  $K$ -Theory**

- Twisted  $K$ -theory via bundles of projective space,
- Calculation of equivariant twisted  $K$ -groups of the adjoint action of a simple, connected, simply connected compact Lie Group

Fall 2007 **Higher Topos Theory**

The homotopy-coherent nerve and the homotopy category of an  $\infty$ -category.

Fall 2006 **Lie Groupoids and Algebroids**

Integration of Lie algebroids

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## Fellowships

2006-2007 Master Class fellowship, MRI

2004-2006 VIGRE fellow, Purdue University



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## Undergraduate Awards

- 2004 Senior Math Award
- 2004 Provost MQP (Senior Thesis) Award - Department of Mathematics
- 2004 Provost MQP Award - Department of Physics
- 2004 Putnam Exam Award\* - Department of Mathematics
- 2002 Bulletin Board Award - Department of Mathematics

\*name published in national ranking of top participants.

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## Professional Affiliations

- 2001-2004 Pi Mu Epsilon - National Mathematics Honors Society  
President of WPI chapter

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## Miscellaneous

**Citizenship:** USA

**Languages:** English: Fluent

French: Verbally fluent, can read/write at a moderate level

Dutch: Conversational