

CONTACT INFORMATION

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RESEARCH AREAS

Homotopy theory, homological algebra, and their applications to deformation theory and geometry.

CURRENT ACADEMIC APPOINTMENT

2021– Associate Professor of Mathematics (with tenure)
Department of Mathematics & Statistics, University of Nevada, Reno.

PRIOR APPOINTMENTS

2016–2020 Assistant Professor (tenure-track)
Department of Mathematics & Statistics, University of Nevada, Reno.
2015–2016 Assistant Professor (tenure-track)
Department of Mathematics, University of Louisiana at Lafayette.
2014–2015 Postdoctoral Research Associate, Institute for Mathematics and Computer Science,
University of Greifswald, Germany.
2011–2014 Postdoctoral Research Associate, Mathematics Institute
University of Göttingen, Germany.

VISITING POSITIONS

Spring 2020 Research member, “Higher Categories and Categorification” Program
Mathematical Sciences Research Institute (MSRI)
Berkeley, California, USA
July 2019 Research visitor
Max Planck Institute for Mathematics
Bonn, Germany
Fall 2010 Junior Research Fellow, “Higher Structures in Mathematics and Physics” Program
Erwin Schrödinger Institute (ESI) for Mathematical Physics
Vienna, Austria

EDUCATION

- 2007–2011 Ph.D. in Mathematics, University of California, Riverside.
- Thesis: *Higher Symplectic Geometry*
- Advisor: John C. Baez
- 1998–2002 Graduate studies in Theoretical Physical Chemistry, University of Pennsylvania.
- Research in applications of differential geometry to condensed matter theory.
- Completed all requirements except submission of Ph.D. dissertation
- 1994–1998 B.S. in Chemistry with honors (minor in Mathematics), University of Scranton.

GRANTS

- 2018 Simons Foundation, 5 Year Collaboration Grant for Mathematicians, Award #585631
Applications of Homotopical Algebra in Deformation Theory and Geometry.
Principal Investigator: CLR
- 2016 Louisiana Board of Regents Support Fund, 3 Yr Research Competitiveness Grant #098A-16
Cohomological and Homotopy-Theoretic Investigations Arising from Classical and Quantum Field Theory.
Principal Investigator: CLR (Returned due to relocation to UNR.)
- 2015 German National Research Foundation (DFG) 3 Year Research Grant, Project ZH 274/1-1:
Homotopy Lie theory: Lie's 2nd Theorem for Lie n -groupoids.
Principal Investigators: CLR, Chenchang Zhu (University of Göttingen).
(CLR's support returned due to relocation to US.)
- 2015 American Mathematical Society/Simons Foundation Travel Grant.
Principal Investigator: CLR

AWARDS

- 2020 Westfall Scholar Faculty Mentor Award. College of Science, UNR
- 2019 Finalist, NSHE Board of Regents' Rising Researcher Award
- 2019 Finalist (declined further consideration),
LeMay Award for Excellence in Teaching in the College of Science, UNR
- 2019 Nomination (unsolicited),
UNR Alan Bible Teaching Excellence Award
- 2010 Oberwolfach Leibniz Graduate Student
- 2010 Dissertation Year Fellowship, University of California, Riverside.
- 2009 Department Qualifying Exam Award, University of California, Riverside.
- 2007 Chancellor's Distinguished Fellow, University of California, Riverside.

REFEREED PUBLICATIONS

1. *An explicit model for the homotopy theory for finite type Lie n -algebras*
Algebraic and Geometric Topology
vol. 20 (2020) 1371–1429
[arXiv link](#) 59 pages
2. *On the homotopy theory for Lie ∞ -groupoids, with an application to integrating L_∞ -algebras*
Coauthored with C. Zhu
Algebraic and Geometric Topology
vol. 20 (2020) 1127–1219
[arXiv link](#) 93 pages
3. *The cohomology of the full directed graph complex*
Coauthored with V. Dolgushev
Algebras and Representation Theory
vol. 23 (2020) 917–961
[arXiv link](#) 45 pages
4. *Homotopical properties of the simplicial Maurer–Cartan functor*
In *MATRIX Annals, MATRIX Book Series 1*
D. Wood, J. de Gier, C. Praeger, T. Tao (Eds.)
Springer Berlin, 2018
[arXiv link](#) 12 pages
5. *On an enhancement of the category of shifted L_∞ -algebras*
Coauthored with V. Dolgushev
Applied Categorical Structures
vol. 25 (2017) 489–503
[arXiv link](#) 15 pages
6. *Homotopy moment maps*
Coauthored with M. Callies, Y. Frégier and M. Zambon
Advances in Mathematics
vol. 303 (2016) 954–1043
[arXiv link](#) 90 pages
7. *Higher $U(1)$ -gerbe connections in geometric prequantization*
Coauthored with D. Fiorenza, and U. Schreiber
Reviews in Mathematical Physics
vol. 28 (2016) 1650012-1–1650012-72
[arXiv link](#) 73 pages
8. *Kontsevich’s graph complex, GRT, and the deformation complex of the sheaf of polyvector fields*
Coauthored with V. Dolgushev and T. Willwacher
Annals of Mathematics
vol. 182 (2015) 855–943
[arXiv link](#) 89 pages

9. *What do homotopy algebras form?*
 Coauthored with V. Dolgushev and A. Hoffnung
Advances in Mathematics
 vol. 274 (2015) 562–605
[arXiv link](#) 44 pages
10. *A version of the Goldman-Millson Theorem for filtered L_∞ -algebras*
 Coauthored with V. Dolgushev
Journal of Algebra
 vol. 430 (2015) 260–302
[arXiv link](#) 43 pages
11. *L_∞ -algebras of local observables from higher prequantum bundles*
 Coauthored with D. Fiorenza and U. Schreiber
Homology, Homotopy and Applications
 vol. 16 (2014) 107–142
[arXiv link](#) 36 pages
12. *2-plectic geometry, Courant algebroids, and categorified prequantization*
Journal of Symplectic Geometry
 vol. 11 (2013) 53–91
[arXiv link](#) 39 pages
13. *A higher Chern-Weil derivation of AKSZ sigma-models*
 Coauthored with D. Fiorenza and U. Schreiber
International Journal of Geometric Methods in Modern Physics
 vol. 10 (2013) 1250078-1–1250078-36
[arXiv link](#) 37 pages
14. *Notes on algebraic operads, graph complexes, and Willwacher's construction*
 Coauthored with V. Dolgushev
Contemporary Mathematics
 vol. 583 (2012) 25–146
[arXiv link](#) 122 pages
15. *L_∞ -algebras from multisymplectic geometry*
Letters in Mathematical Physics
 vol. 100 (2012) 29–50
[arXiv link](#) 22 pages
16. *Categorified symplectic geometry and the string Lie 2-algebra*
 Coauthored with J. Baez
Homology, Homotopy and Applications
 vol. 12 (2010) 221–236
[arXiv link](#) 16 pages
17. *Categorified symplectic geometry and the classical string*
 Coauthored with J. Baez and A. Hoffnung
Communications in Mathematical Physics
 vol. 293 (2010) 701–725
[arXiv link](#) 25 pages

18. *A geometric formulation of quantum stress fields*
Coauthored with A. Rappe
Physical Review B
vol. 65 (2002) 224117-1–224117-8
19. *Unique quantum stress fields*
Coauthored with A. Rappe
AIP Conference Proceedings
vol. 582(1) (2001) 91–96
20. *Geometric theory of stress fields for quantum systems at finite temperature*
Coauthored with A. Rappe
In Computer Simulation Studies in Condensed-Matter Physics XIV
Springer Proceedings in Phys., 89, D.P. Landau *et al* (Eds.)
Springer-Verlag New York, 2001

SUBMITTED FOR PUBLICATION

1. *Complete filtered L_∞ -algebras and their homotopy theory*
[arXiv link](#) 43 pages
2. *Which homotopy algebras come from transfer?*
Coauthored with M. Markl
[arXiv link](#) 15 pages

MANUSCRIPTS IN PREPARATION

1. *Lie's 3rd theorem for L_∞ -algebras*
Coauthored with Jesse Wolfson
10 pages
2. *Fibrations and k -invariants of finite-type Lie n -algebras*
Coauthored with A. Ozbek (former MS student)
12 pages
3. *Halperin-Stasheff models, homotopy transferred structures and deformation*
Coauthored with P. Milham (current Ph.D. student) and He Wang (former post-doc)
21 pages

INVITED CONFERENCE, COLLOQUIUM, AND SEMINAR TALKS

1. "Which homotopy algebras come from transfer?"
3rd International Conference on Operad Theory and Related Topics
Jilin University, China
September 2020
2. "From graph complexes to Chern classes"
ESI Program on Higher Structures and Field Theory
Erwin Schrödinger Institute, University of Vienna, Austria
August 2020 (rescheduled due to COVID-19 pandemic)
3. "From graph complexes to Chern classes"
Cascade Topology Seminar
Boise State University
May 2020 (postponed due to COVID-19 pandemic)
4. "Lie's 3rd Theorem for L_∞ -algebras"
Deformation Theory Seminar
Department of Mathematics, University of Pennsylvania
April 2020 (postponed due to COVID-19 pandemic)
5. "Explicit models of homotopy theories for L_∞ -algebras and applications"
Algebraic Topology Seminar
Institute of Mathematics Czech Academy of Sciences, Czech Republic
July 2019
6. "Homotopy theory for Kan simplicial manifolds"
Geometry and Topology Seminar
Department of Mathematics, University of California, Irvine
April 2019
7. "Homotopical applications of convolution"
International Conference on Operad Theory and Related Topics
Anhui University, Hefei, China
November 2018
8. "Homotopy transfer as a deformation problem"
Department Colloquium
Department of Mathematical Sciences, Montana State University
March 2018
9. "Formal deformation problems and the unicity of homotopy transfer"
Recent Developments in Noncommutative Algebra and Related Areas
University of Washington, Seattle, WA
March 2018
10. "The unicity of homotopy transfer: A deformation theoretic proof"
Special Session on Cohomology, Deformations, and Quantum Groups
AMS Fall Eastern Sectional Meeting, SUNY Buffalo
September 2017

11. "A homotopy theory for Lie n -groupoids with applications to integration and differentiation"
 Conference on Poisson Geometry and Stacks
 Fields Institute, Toronto, Canada
August 2017
12. "Towards an adjunction between the homotopy theories of dg manifolds and Lie ∞ -groupoids"
 BIRS-CMO Workshop: Field Theories and Higher Structures in Mathematics and Physics
 Casa Matemática Oaxaca, Mexico
June 2017
13. "Homotopical properties of the simplicial Maurer–Cartan functor"
 Deformation Theory Seminar
 Department of Mathematics, University of Pennsylvania
March 2017
14. "From Hamiltonian mechanics to homotopical Lie theory"
 Department Seminar
 Department of Mathematics, University of California, Riverside
December 2016
15. "Integrating quasi-isomorphisms between L_∞ -algebras"
 Special Session on Topology and Physics
 AMS 2016 Fall Central Sectional Meeting, Minneapolis, MN
October 2016
16. "What do homotopy algebras form?"
 Program on Higher Structures in Geometry and Physics
 MATRIX Research Institute, University of Melbourne, Australia
June 2016
17. "From Hamiltonian mechanics to homotopical Lie theory"
 Department Colloquium
 Department of Mathematics & Statistics, University of Nevada, Reno
April 2016
18. "Equivariant cohomology and homotopy moment maps"
 ESI Program on Higher Structures in String Theory and Quantum Field Theory
 Erwin Schrödinger Institute, University of Vienna, Austria
December 2015
19. "What do homotopy algebras form?"
 Special Session on Cohomology of Algebras and Deformation Theory
 AMS 2015 Fall Central Sectional Meeting, Chicago, IL
October 2015
20. "Equivariant cohomology, homotopy moment maps, and gauged sigma models"
 Lie Group and Moduli Space Seminar
 University of Geneva, Switzerland
April 2015

21. "From Hamiltonian mechanics to homotopical Lie theory"
 Department Colloquium
 Department of Mathematics, University of Louisiana at Lafayette
March 2015
22. "From Hamiltonian mechanics to homotopical Lie theory"
 Symposium on Mathematical Physics
 University of Zürich, Switzerland
November 2014
23. "What do homotopy algebras form?"
 Workshop on String Geometry and Loop Spaces
 University of Greifswald, Germany
July 2014
24. "Symmetries of closed differential forms and Lie algebras up to homotopy"
 Special Session on Symplectic and Contact Structures on Manifolds with Special Holonomy
 Joint Mathematics Meetings, Baltimore, MD
January 2014
25. "What do homotopy algebras form?"
 Conference on Higher Lie Theory
 University of Luxembourg, Luxembourg
December 2013
26. "Geometric prequantization and homotopy Lie theory"
 Special Session on Higher Structures in Algebra, Geometry and Physics
 AMS 2013 Fall Eastern Sectional Meeting, Philadelphia, PA
October 2013
27. " L_∞ -algebras and geometric prequantization"
 Algebraic Analysis and Geometry Workshop
 University of Padua, Italy
September 2013
28. "Lie algebras up to homotopy and the geometry of closed differential forms"
 Department Colloquium
 Department of Mathematics & Statistics, University of Nevada, Reno
August 2013
29. "Geometric prequantization and homotopy Lie theory"
 Special Session on Mathematical Physics, Operad Theory, Algebraic Topology and Higher Categories
 Mathematical Congress of the Americas, Guanajuato, Mexico
August 2013
30. "Higher symplectic geometry"
 XXI International Fall Workshop on Geometry and Physics
 Universidad de Burgos, Spain
August 2012

31. "Towards higher geometric quantization"
Higher Structures in China III
Jilin University, China
August 2012
32. "Towards higher geometric quantization"
Higher Differential Geometry Seminar
Max Planck Institute for Mathematics, Bonn, Germany
May 2012
33. "Towards higher geometric quantization"
Mathematical Physics Seminar
Department of Mathematics, University of Hamburg, Germany
March 2012
34. "Lie algebras up to homotopy and generalized geometry"
Algebra and Geometry Seminar
Department of Mathematics, Sapienza Università di Roma, Italy
February 2012
35. "Higher geometric quantization"
Higher Structures in Mathematics and Physics 2011
University of Göttingen, Germany
November 2011
36. "Higher symplectic geometry and geometric quantization"
Quarterly Seminar on Topology and Geometry
Utrecht University, Netherlands
October 2011
37. " L_∞ -algebras from higher symplectic geometry"
Special Session on Physically Inspired Higher Homotopy Algebra
AMS 2011 Spring Eastern Sectional Meeting, Worcester, MA
April 2011
38. " L_∞ -algebras from higher symplectic geometry"
Deformation Theory Seminar
Department of Mathematics, University of Pennsylvania
November 2010
39. "Mini-course on categorified symplectic geometry"
ESI Program on Higher Structures in Mathematics and Physics
Erwin Schrödinger Institute, University of Vienna, Austria
October 2010
40. " L_∞ -algebras from multisymplectic geometry"
Differential Geometry Seminar
Department of Mathematics, University of California, Riverside
May 2010

41. "An invitation to higher symplectic geometry"
Seminaire Mathématique
Unité de Recherche en Mathématiques, University of Luxembourg, Luxembourg
January 2010
42. "Lie 2-algebras, 2-plectic geometry, and strings"
String Theory Seminar
Department of Mathematics, University of California, Davis
May 2009
43. "Lie 2-algebras from 2-plectic geometry"
Courant Institute Workshop: Higher Structures in Topology and Geometry II
University of Göttingen, Germany
February 2009

RESEARCH ADVISING AND THESES DIRECTED

Postdoctoral Researchers

2016–2019 Dr. He Wang, University of Nevada, Reno
Current position: Assistant Professor of Practice
Department of Mathematics
Northeastern University

Ph.D. Students

2019 – Patricia Milham, University of Nevada, Reno
Thesis topic: Algebraic deformation theory in positive characteristic and Whitehead's realization problem

2017 – 2019 Richard Foote, University of Nevada, Reno
Current position: pursuing career in data science

Masters Students

2019 – Jenna Moore, University of Nevada, Reno
Thesis topic: Applications of Galois cohomology and descent in algebra

2018 – 2019 Aydin Ozbek, University of Nevada, Reno
Thesis title: "The homotopy theory of commutative dg algebras
and representability theorems for Lie algebra cohomology"
Current position: Ph.D. student
Department of Mathematics
University of Oregon

Undergraduate Honors Students

2019 – 2020 Daniel Mallory, University of Nevada, Reno
Thesis title: "Grothendieck's *dessins d'enfants* and Belyi's classification
of algebraic curves over $\overline{\mathbb{Q}}$ "
Current position: Ph.D. student
Department of Mathematics
Northwestern University

2019 – 2020 Emerson (John) Grifall-Sabo, University of Nevada, Reno
Thesis title: "Frobenius algebras and $2D$ topological quantum field theories"
Current position: M.S. student
Department of Mathematics & Statistics
University of Nevada, Reno

TEACHING

University of Nevada, Reno (as primary instructor)

Spring 2021 Math 780: Homotopy Theory
Spring 2021 Math 440/640: Topology
Fall 2020 Math 780: Algebraic Geometry
Fall 2020 Math 441/641: Introduction to Algebraic Topology
Fall 2019 Math 331: Groups, Rings and Fields
Fall 2019 Math 330: Linear Algebra (2 sections)
Fall 2019 Math 793: Graduate Independent Study: Deformation Theory
Summer 2019 Math 499: Undergraduate Independent Study: Topological Quantum Field Theory
Spring 2019 Math 499: Undergraduate Independent Study: Frobenius Algebras
Spring 2019 Math 793: Graduate Independent Study: Lie Groups and Van Est's Theorem
Fall 2018 Math 780: Topics in Galois Theory
Fall 2018 Math 499: Undergraduate Independent Study: Field and Galois Theory
Fall 2018 Math 182: Calculus II
Spring 2018 Math 732: Graduate Abstract Algebra II
Spring 2018 Math 793: Graduate Independent Study: Abstract Homotopy Theory
Spring 2018 Math 499: Undergraduate Independent Study: Module Theory
Fall 2017 Math 731: Graduate Abstract Algebra I
Fall 2017 Math 331: Groups, Rings and Fields
Spring 2017 Math 301: Introduction to Proofs
Spring 2017 Math 499: Undergraduate Independent Study: Advanced Linear Algebra
Fall 2016 Math 330: Linear Algebra

University of Louisiana at Lafayette (as primary instructor)

Spring 2016 Math 536: Graduate Topology II
Fall 2015 Math 535: Graduate Topology I
Fall 2015 Math 250: Applied Calculus
Fall 2015 Math 497: Undergraduate Independent Study: Applied Topology

University of Greifswald (as primary instructor)

Summer 2015 Introduction to Algebraic Topology
Winter 2014 Introduction to Undergraduate Topology

University of Göttingen (as primary instructor)

Winter 2013 Graduate seminar: Deligne's Conjecture & Tamarkin's Formality Theorem
Summer 2013 Graduate seminar: Topics in Higher Structures
Summer 2012 Graduate seminar: C^∞ -Schemes

PROFESSIONAL SERVICE

Referee (peer review) for the following research journals

<i>Annales de l'Institut Fourier</i>	<i>Advances in Mathematics</i>
<i>Compositio Mathematica</i>	<i>Differential Geometry and its Applications</i>
<i>Higher Structures</i>	<i>Journal of Algebra</i>
<i>Journal of Differential Geometry</i>	<i>Journal of Geometry</i>
<i>Journal of Mathematical Physics</i>	<i>Journal of Noncommutative Geometry</i>
<i>Journal of Pure and Applied Algebra</i>	<i>Journal of Symplectic Geometry</i>
<i>Letters in Mathematical Physics</i>	<i>Mathematical Physics, Analysis and Geometry</i>
<i>Quarterly Journal of Mathematics</i>	<i>Theory and Applications of Categories</i>
<i>Applied Categorical Structures</i>	

Conference organization

- 2021 Co-organizer "Special Session on Connections between Homotopical Algebra and Geometry", AMS 2021 Spring Western Sectional meeting. 1–2 May, 2021
- 2014 Co-organizer "Higher Structures in Philadelphia", Temple University, 11–13 August 2014
- 2012 Co-organizer "Higher Structures in Topology and Geometry VI", University of Göttingen, 9–11 July 2012

Miscellaneous

2011 – 2019 Thirty-six reviews written for *Mathematical Reviews* (MathSciNet ID: 888087)

UNIVERSITY SERVICE

Department Committees and Organizations (University of Nevada, Reno)

- 2019 – 2020 Mathematics TT Search Committee Member
- 2019 – Algebraic Topology and Geometry Seminar organizer
- 2018 – Mathematics Graduate Program Committee
- 2017 – Department Colloquium Committee Chair
- 2017 – Algebra Research Seminar organizer
- 2016 – 2017 Graduate Student Recruiting Committee Member
- 2016 – 2017 External Department Chair Search Committee Member

Graduate Exam Committees (University of Nevada, Reno)

- Fall 2019 Algebra Ph.D Qualifying Exam Committee Chair
- Spring 2019 Algebra Ph.D Qualifying Exam Committee Chair

Service at University of Louisiana at Lafayette

- Spring 2017 Ph.D. Dissertation Committee Member (Voja Petrovic)
- Summer 2016 Topology Committee Chair, Ph.D Comprehensive Exams
- Spring 2016 MS Comprehensive Exam Committee Chair (Phallon Robin)
- Spring 2016 MS Comprehensive Exam Committee Member (Richard Foote)
- 2015 – 2016 Topology Seminar Organizer
- 2015 – 2016 Undergraduate Math Club Committee Member