

# Daniel Halpern-Leistner

## Curriculum Vitae

Department of Mathematics  
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Citizenship: USA

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### Employment and Education:

- 2016-            Ritt Assistant Professor, Columbia University.  
2013-2016    NSF Postdoctoral Fellow, Columbia University.  
2014-2015    Member and NSF Postdoctoral Fellow, Institute for Advanced Study.  
2007-2013    Ph.D. in Mathematics, University of California, Berkeley.  
                  *Advisor:* Constantin Teleman  
                  *Thesis:* “Geometric invariant theory and derived categories of coherent sheaves”
- 2003-2007    A.B. in Mathematics, Princeton University.  
                  *Undergraduate Thesis:* “On the algebraic structure of dynamical systems”

#### *As visitor*

- 2010 Fall     Max Planck Institute for Mathematics  
2008-2009    Stanford University (Applied Physics).

### Scientific Awards / Grants:

- 2016-            NSF personal grant in Algebra & Number Theory (recommended for funding, pending final confirmation)  
2013-2016    NSF Postdoctoral Research Fellowship (MSPRF).  
2013            Kenneth Ribet and Lisa A. Goldberg Award in Algebra (thesis prize in algebra).

### Research interests:

Moduli problems, representation theory, geometric invariant theory, derived algebraic geometry, derived categories of coherent sheaves

### Publications and preprints:

*The equivariant Verlinde formula on the moduli of Higgs bundles*, with an appendix by Constantin Teleman, [arXiv:1608.01754](https://arxiv.org/abs/1608.01754)

*Combinatorial constructions of derived equivalences*, with Steven Sam, [arXiv:1601.02030](https://arxiv.org/abs/1601.02030) (submitted)

*Equivariant Hodge theory and noncommutative geometry*, with Daniel Pomerleano, [arXiv:1507.01924](https://arxiv.org/abs/1507.01924) (submitted).

*Tannaka duality revisited*, with Bhargav Bhatt, [arXiv:1507.01925](https://arxiv.org/abs/1507.01925) (accepted to Advances in Mathematics).

*Remarks on Theta-stratifications and derived categories*, [arXiv:1502.03083](https://arxiv.org/abs/1502.03083).

*On the structure of instability in moduli theory*, [arXiv:1411.0627](https://arxiv.org/abs/1411.0627)

*Mapping stacks and categorical notions of properness*, with Anatoly Preygel, [arXiv:1402.3204](https://arxiv.org/abs/1402.3204)

*Autoequivalences of derived categories via GIT*, with Ian Shipman, Advances in Mathematics (to appear), [arXiv:1303.5531](https://arxiv.org/abs/1303.5531)

*The derived category of a GIT quotient*, J. Amer. Math. Soc., published electronically Oct. 31, 2014

*Lefschetz Hyperplane Theorem for Stacks*, [arXiv:1008.0891](https://arxiv.org/abs/1008.0891)

*The algebraic structure of dynamical systems*, (undergraduate thesis)

#### **In preparation:**

*Yangian actions on derived categories of coherent sheaves*, with Davesh Maulik and Andrei Okounkov

We construct “stable envelope functors” in equivariant derived categories of coherent sheaves and categorify the results of Maulik & Okounkov’s paper “Quantum groups and quantum cohomology” ([arXiv:1211.1287](https://arxiv.org/abs/1211.1287))

#### **Invited lecture series:**

Freie Universitaet Berlin (New techniques in GIT conference, September 2015)

Beyond geometric invariant theory

[http://userpage.fu-berlin.de/hoskins/workshop\\_GIT.html](http://userpage.fu-berlin.de/hoskins/workshop_GIT.html)

University of Toronto (March 2013)

*Master class on geometric invariant theory and derived categories of coherent sheaves*,

<http://www.math.toronto.edu/ryan/MasterClassSpring13/>

#### **Invited lectures:**

2016

Banff International Research Station (Homological mirror geometry conference, March)

*Magic windows and representations of generalized braid groups on the derived category of a GIT quotient*

2015

University of Oxford (seminar, December)  
*(Lecture 1) The structure of instability in moduli theory*  
*(Lecture 2) Applications of Theta-stratifications*

UNC Chapel Hill (workshop on new developments in moduli and geometric invariant theory, November)  
*Applications of Theta-stratifications*

Northeastern University (algebraic geometry seminar, November)  
*Tannaka duality and the unreasonable effectiveness of linear algebra.*

Cornell University (topology seminar, October)  
*Equivariant topology and non-commutative geometry*

Massachusetts Institute of Technology (algebraic geometry seminar, September)  
*Equivariant Hodge theory*

AMS Summer institute in algebraic geometry (conference, July)  
*Theta-reductive moduli problems, stratifications, and applications*

University of Warwick (workshop on derived categories and birational geometry, June)  
*Equivariant Hodge theory*

University of Edinburgh (EDGE seminar, May)  
*Equivariant Hodge theory*

Rutgers-Newark (colloquium, April)  
*Beyond geometric invariant theory*

Mathematisches Forschungsinstitut Oberwolfach (algebraic geometry conference, March)  
*Theta-reductive moduli problems, stratifications, and applications*

Stony Brook University (algebraic geometry seminar, March)  
[\*Reductive moduli problems, stratifications, and applications\*](#)

Harvard University (gauge theory, topology, and symplectic geometry seminar, Feb)  
*Morse-like stratifications of moduli problems in algebraic geometry*

Rutgers University (geometry, symmetry, and physics seminar, Feb)  
*Equivariant noncommutative Hodge theory*

University of Chicago (algebraic geometry seminar, Feb)  
[\*Reductive moduli problems, stratifications, and applications\*](#)

UIUC (algebraic geometry seminar, Feb)  
*Reductive moduli problems, stratifications, and applications*

2014

Rice University (algebraic geometry seminar, Nov)  
*Instability in moduli theory*

Cal Tech (algebraic geometry seminar, Oct)  
*The structure of instability in moduli theory*

KIAS (ICM satellite conference: Geometry and Physics of Gauged Linear Sigma Model, July)  
*The structure of instability in moduli theory*

University of Pennsylvania (Math-physics joint seminar, April)  
*Instability in Moduli Theory*

UBC (PIMS geometry and physics seminar, Feb)  
*Instability in algebraic geometry*

UIUC (algebraic geometry seminar, Feb)  
*Mapping stacks and the notion of properness in algebraic geometry*

2013

Rutgers University (geometry, symmetry, and physics seminar, Oct)

*Instability in algebraic geometry*

Columbia University (algebraic geometry seminar, Oct)

*Instability in algebraic geometry*

University of Michigan (conference, Geometry and Physics of Gauged Linear Sigma Model, March)

*Stratifications of algebraic stacks and derived categories*

2012

Institute for the Physics and Mathematics of the Universe (conference, Homological Projective Duality and Quantum Gauge Theory, march)

*Fractional grade restriction rules and autoequivalences of derived categories*

UC Berkeley (workshop, Tensors and their Geometry in High Dimensions, Sept)

*Geometric invariant theory and derived categories*

University of Vienna (workshop, Birational Geometry and Derived Categories, Aug)

*Derived Kirwan surjectivity and autoequivalences of derived categories*

University of Warwick (conference, School on Algebraic Geometry and Theoretical Physics, July)

*Localization and the derived category of a GIT quotient*

Institute for the Physics and Mathematics of the Universe (DMM seminar, June)

*The derived category of a GIT quotient*

UC Berkeley (RTGC seminar, March)

*The derived category of a GIT quotient*

2011

University of Georgia (Southeastern Section Meeting of the AMS)

*The Lefschetz Hyperplane Theorem for stacks.*

### Teaching:

- Topics in Algebraic Geometry at Columbia University (scheduled Fall 2016)
- Co-organized the Columbia Research Experience for Undergraduates program on the “properties of random varieties.” (Summer 2016)
- Calc III (Multivariable calculus) at Columbia University (Spring 2016)
- At UC Berkeley:
  - Served 5 semesters as a Graduate Student Instructor for lower division courses.
  - Served as the instructor of record at UC Berkeley for
    - Math 1B (second semester calculus), Summer 2009.
    - Math 191 (undergraduate topics course), Spring 2013; Designed an upper level undergraduate course on the complex and differential geometry of Riemann surfaces
  - Organized graduate seminars: Moduli spaces in algebraic geometry (Spring 2013), Gromov-Witten Theory (Spring 2010), Weekly student Lunch Seminar (2010-2013)

### Other activities:

- Served as departmental representative (official faculty contact and organizer) for Columbia Summer Session in Mathematics.

- Created HTML/Java code to produce concept maps: interactive diagrams showing the key concepts, theorems, and papers in a subject and how they are related
- Served as a mentor for younger graduate students in the geometry group through the Math Graduate Student Association 2010-2013

**Collaborators:** Bhargav Bhatt, Brian Conrad, Jochen Heinloth, Davesh Maulik, Kevin McGerty, Tom Nevins, Andrei Okounkov, Daniel Pomerleano, Anatoly Preygel, Steven Sam, Ian Shipman

**Languages:** English, German