

# David Benjamin Antieau

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## Academic positions

- 2017- *Associate Professor*, University of Illinois at Chicago.
- 2014-2017 *Assistant Professor*, University of Illinois at Chicago.
- 2013-2014 *Acting Assistant Professor*, the University of Washington.
- 2010-2013 *RTG Assistant Adjunct Professor*, UCLA.

## Areas of specialization

Brauer groups • (derived) algebraic geometry •  $K$ -theory

## Education

- 2010 PhD in Mathematics, University of Illinois at Chicago.
- 2006 MSc in Mathematics, University of Illinois at Chicago.
- 2004 AB in Philosophy, University of Chicago.

## Dissertation

The spectral index of Brauer classes, advised by Henri Gillet.

## Awards

- 2016-2020 NSF CAREER Award DMS-1552766 of \$454,942 for the project *CAREER: Higher Brauer Groups and Topological Azumaya Algebras*.
- 2016 UIC Visitors' Fund Award of \$2,500 to support David Gepner's visit to UIC in April 2016.
- 2016 LAS Faculty Award (co-PI; PI: David Dumas) of \$49,000 for the project *The Mathematical Computing Laboratory: an undergraduate research center*.
- 2015 UIC Visitors' Fund Award of \$5,000 to support speakers for the Midwest Topology Seminar at UIC in February, 2015.
- 2013-2016 NSF Grant DMS-1307505 of \$101,279 for the project *Topological methods for Azumaya algebras*.

- 2014-2016 SQuaRE at the American Institute of Mathematics on the geometry of Azumaya algebras in dimension 3, three week-long small group workshops with Asher Auel, Colin Ingalls, Daniel Krashen, and Max Lieblich.
- 2013 AMS-Simons Travel Grant of \$4,000. Declined due to award of NSF grant.
- 2009 AMS Travel Grant Award of \$500 to attend the 2010 Joint Meetings.
- 2009 Midwest Topology Network Grant of \$1,000 to attend *Homotopy theory and applications* at University of Nebraska, Lincoln.

## Research memberships

Max Planck Institute for Mathematics, Bonn, 4-13 January 2018.

Hausdorff Institute of Mathematics, Bonn, 7-27 May 2017.

University of Copenhagen, 12-19 June 2016.

Hausdorff Institute of Mathematics, Bonn, 1-30 June 2015.

## Publications & talks

### JOURNAL ARTICLES

B. Antieau, A. Mathew, and T. Nikolaus, *On the Blumberg–Mandell Künneth theorem for  $TP$* , *Selecta Mathematica*, published online 1 August 2018, <https://doi.org/10.1007/s00029-018-0427-x>.

B. Antieau and J. Heller, *Some remarks on topological  $K$ -theory of dg categories*, *Proc. Amer. Math. Soc.* **146** (2018), 4211–4219.

B. Antieau and E. Elmanto, *A primer for unstable motivic homotopy theory*, *Surveys on Recent Developments in Algebraic Geometry*, *Proc. Sympos. Pure Math.* **95** (2017), 305–370.

B. Antieau and B. Williams, *Prime decomposition for the index of a Brauer class*, *Annali della Scuola Normale di Pisa, Classe di Scienze (5) XVII* (2017), 277–285.

B. Antieau and G. Stevenson, *Derived categories of representations of small categories over commutative noetherian rings*, *Pacific Journal of Mathematics* **283** (2016), no. 1, 21–42.

B. Antieau, *On the integral Tate conjecture for finite fields and representation theory*, *Algebraic Geometry* **3** (2016), no. 2, 138–149.

B. Antieau, T. Barthel, and D. Gepner, *On localization sequences in the algebraic  $K$ -theory of ring spectra*, *Journal of the European Mathematical Society* **20** (2018), no. 2, 459–487.

B. Antieau and K. Chan, *Maximal orders in unramified central simple algebras*, *Journal of Algebra* **452** (2015), 94–105.

B. Antieau, D. Krashen, and M. Ward, *Derived categories of torsors for abelian schemes*, *Advances in Mathematics* **306** (2017), 1–23.

B. Antieau and B. Williams, *The prime divisors of the period and index of a Brauer class*, *Journal of Pure and Applied Algebra* **219** (2015), no. 6, 2218–2224.

B. Antieau and B. Williams, *Topology and purity for torsors*, *Documenta Mathematica* **20** (2015), 333–355.

B. Antieau, *Twisted derived equivalences for affine schemes*, *Brauer groups and obstruction problems*

- (Palo Alto, 2013), Progress in mathematics, vol. 320, Birkhauser Basel, 2017, 7–12.
- B. Antieau, *A reconstruction theorem for abelian categories of twisted sheaves*, J. reine angew. Math. **2016** (2016), no. 712, 175–188.
- B. Antieau, *A local-global principle for the telescope conjecture*, Advances in Mathematics **254** (2014), 280–299.
- B. Antieau, *Étale twists in noncommutative algebraic geometry and the twisted Brauer space*, Journal of Noncommutative Geometry **11** (2017), no. 1, 161–192.
- B. Antieau and D. Gepner, *Brauer groups and étale cohomology in derived algebraic geometry*, Geometry & Topology **18** (2014), no. 2, 1149–1244.
- B. Antieau and B. Williams, *On the classification of oriented 3-plane bundles over a 6-complex*, Topology and its Applications **173** (2014), 91–93.
- B. Antieau and B. Williams, *Unramified division algebras do not always contain Azumaya maximal orders*, Inventiones Mathematicae **197** (2014), no. 1, 47–56.
- B. Antieau and B. Williams, *The topological period-index problem over 6-complexes*, Journal of Topology **7** (2014), 617–640.
- B. Antieau and B. Williams, *Serre-Godeaux varieties and the étale index*, Journal of K-theory **11** (2013), no. 2, 283–295.
- B. Antieau, D. Gepner, and J. Gómez, *Actions of  $K(\pi, n)$ -spaces on  $K$ -theory and uniqueness of twisted  $K$ -theory*, Trans. Amer. Math. Soc. **366** (2014), no. 7, 3631–3648.
- B. Antieau and B. Williams, *The period-index problem for twisted-topological  $K$ -theory*, Geometry & Topology **18** (2014), no. 2, 1115–1148.
- B. Antieau, *On a theorem of Hazrat and Hoobler*, Proc. Amer. Math. Soc. **141** (2013) no. 8, 2609–2613.
- B. Antieau, A. Ovchinnikov, and D. Trushin, *Galois theory of difference equations with periodic parameters*, Communications in Algebra **42** (2014), no. 9, 3902–3943.
- B. Antieau, *Cohomological obstruction theory for Brauer classes and the period-index problem*, Journal of K-theory **8** (2011), no. 3, 419–435.
- B. Antieau, *Čech approximation to the Brown-Gersten spectral sequence*, Homology, Homotopy and Applications **13** (2011), no. 1, 319–348.
- PREPRINTS
- B. Antieau and T. Nikolaus, *Cartier modules and cyclotomic spectra*, (2018), [arxiv:1809.01714](https://arxiv.org/abs/1809.01714).
- B. Antieau, *Periodic cyclic homology and derived de Rham cohomology*, (2018), [arxiv:1808.05246](https://arxiv.org/abs/1808.05246).
- B. Antieau and G. Vezzosi, *A remark on the Hochschild–Kostant–Rosenberg theorem in characteristic  $p$* , (2017), [arxiv:1710.06039](https://arxiv.org/abs/1710.06039).
- B. Antieau, A. Auel, C. Ingalls, D. Krashen, and M. Lieblich, *Period-index bounds for arithmetic threefolds*, (2017), [arxiv:1704.05489](https://arxiv.org/abs/1704.05489).
- B. Antieau, D. Gepner, and J. Heller, *On the theorem of the heart in negative  $K$ -theory*, (2016), [arxiv:1610.07207](https://arxiv.org/abs/1610.07207).
- B. Antieau and L. Meier, *The Brauer group of the moduli space of elliptic curves*, (2016), [arxiv:1608.00851](https://arxiv.org/abs/1608.00851).

#### LECTURE SERIES

*Topological K-theory* at the “Second Chicago summer school in geometry and topology,” University of Chicago, 25-29 July 2016.

*Computations and applications* at “Introduction to unstable motivic homotopy theory,” Universität Münster, Germany, 10-12 June 2016.

*Introduction to derived algebraic geometry* at “Derived algebraic geometry with a focus on derived symplectic techniques,” University of Warwick, England, April 2015.

#### CONFERENCE TALKS AND INTERNATIONAL SEMINARS

*Cartier modules and cyclotomic spectra* at “Witt vectors, deformations, and absolute geometry,” University of Vermont, 17 July 2018.

*Weibel’s conjecture after Kerz*, Universität Münster, 26 June 2018.

*Cyclotomic spectra and Dieudonné modules II* at “Equivariant homotopy theory and  $K$ -theory,” Berlin, 22 June 2018.

*Dieudonné modules and cyclotomic spectra* at “ $\infty$ -categories,  $\infty$ -operads, and their applications,” CMO-BIRS, 10 May 2018.

*Cyclotomic spectra and crystals* at MPIM, 11 January 2018.

*Negative and homotopy  $K$ -theory of ring spectra and extensions of the theorem of the heart* at “Recent trends in algebraic cycles, algebraic  $K$ -theory, and motives at the Mathematical Congress of the Americas,” Montreal, 25 July 2017.

*Negative and homotopy  $K$ -theory of ring spectra and extensions of the theorem of the heart* at “Triangulated Categories and Geometry - a conference in honour of Amnon Neeman,” Universität Bielefeld, 16 May 2017.

*Negative and homotopy  $K$ -theory of ring spectra and extensions of the theorem of the heart* at the “Workshop:  $K$ -theory in algebraic geometry and number theory,” Hausdorff Institute for Mathematics, 15 May 2017.

*Preface to the theory of higher Azumaya algebras* at the “Conference on invertible objects and duality in DAG and homotopy theory,” Universität Regensburg, 4 April 2017.

*$K$ -theory of  $t$ -categories* at Imperial College, London, 8 June 2016.

*The Brauer group of the moduli stack of elliptic curves* at King’s College, London, 7 June 2016.

*Negative and homotopy  $K$ -theory of ring spectra and extensions of the theorem of the heart* at Universität Bonn, 10 May 2016.

*Prime decompositions in period-index problems via representation theory* at “The use of linear algebraic groups in geometry and number theory,” Banff International Research Station, September 2015.

*Dévissage, hearts, traces, and units in  $K$ -theory* at the “Workshop on homotopy theory, manifolds, and field theories,” Max Planck Institute for Mathematics, June 2015.

*Derived categories of genus 1 curves* at the ICM satellite conference “ $K$ -theory and related topics,” Beijing, August 2014.

*Algebraic topology and algebraic torsors* at UBC, March 2014.

*Derived categories of genus 1 curves* at University of Zurich, March 2014.

*Derived categories of genus 1 curves* at Universität Bielefeld, March 2014.

*Brauer groups and étale cohomology in derived algebraic geometry*, Virginia Conference on Algebraic Topology, June 2012.

#### WORKSHOP TALKS

*The topological period-index problem* at the “Southern California Algebraic Geometry Seminar,” USC, 14 April 2018.

*Discrete approximations* at “Graduate Research Opportunities for Women,” Northwestern University, 15 October 2017.

*The Brauer group of the moduli stack of elliptic curves* at the “Spring 2017 JHU-UMD Algebra and Number Theory Day,” Johns Hopkins University, 15 April 2017.

*Vector bundles and motivic homotopy theory* at the 2015 Algebraic Geometry Summer Research Institute Bootcamp, July 2015.

*Localization sequences in K-theory and a question of Rognes* at the “Higher structures and cohomology theories” workshop, University of Pittsburgh, March 2015.

*Derived categories of elliptic fibrations* at the workshop “Homological Methods in Algebraic Geometry,” University of Wisconsin-Madison, April 2014.

*Thick subcategories of compact R-module spectra* at the Cascade Topology Seminar, 2-3 November 2013.

*Topology and purity for torsors* at the Bellingham Algebraic Geometry Seminar, 20 October 2013.

*Derived categories of principal homogeneous spaces of abelian varieties*, Southern California Algebraic Geometry Seminar, April 2013.

*Azumaya maximal orders do not always exist*, Special session “The Brauer Group in Algebra and Geometry” at the AMS Joint Meetings, January 2013.

*Topological perspectives on the period-index problem*, 10th Brauer Group Conference, 6-10 August 2012.

*The étale index of division algebras*, Special session “Homotopy theory and K-theory” at the AMS Western Section Meeting, 10 October 2010.

*Galois theory for difference equations with difference parameters*, Special session “Differential Galois theory and group representations” at the AMS Joint Meetings, 15 January 2010.

#### COLLOQUIA

*Division algebras, the period-index conjecture and topological methods* at University of Arizona, 2 March 2017.

#### INVITED SEMINAR TALKS

*The topological period-index problem* at University of Oregon, 10 April 2018.

*The topological period-index conjecture* at Rice University, 13 February 2018.

*The Brauer group of the moduli stack of elliptic curves* at Northwestern University, 1 May 2017.

*The Brauer group of the moduli stack of elliptic curves* at University of Arizona, 1 March 2017.

*Negative and homotopy K-theory of ring spectra and extensions of the theorem of the heart* at MIT,

27 February 2017.

*The Brauer group of the moduli stack of elliptic curves* at Stony Brook, 7 February 2017.

*The Brauer group of the moduli stack of elliptic curves* at UIUC, 29 November 2016.

*The Brauer group of the moduli stack of elliptic curves* at Purdue University, 16 November 2016.

*The Brauer group of the moduli stack of elliptic curves* at the Courant Institute at New York University, 3 May 2016.

*The Brauer group of the moduli stack of elliptic curves* at Yale University, 3 March 2016.

*Topological obstructions for algebraic objects* at Northwestern University, 2 November 2015.

*Recent work on the integral Hodge conjecture* at University of Michigan, 7 October 2015.

*Derived categories of elliptic fibrations* at Northwestern University, 5 February 2015.

*Localization sequences in  $K$ -theory and a question of Rognes* at University of Chicago, 27 January 2015.

*Some problems on maximal orders in division algebras* at Columbia University, 5 September 2014.

*Division algebras and representations of complex Lie groups* at University of Illinois at Chicago, 20 February 2014.

*Division algebras and representations of complex Lie groups* at University of Illinois at Urbana-Champaign, 21 January 2014.

*Division algebras and representations of complex Lie groups* at Indiana University, 15 January 2013.

*Division algebras and representations of complex Lie groups* at University of Virginia, 13 January 2013.

*Division algebras and representations of complex Lie groups* at University of South Carolina, 10 January 2014.

*Division algebras and representations of complex Lie groups* at University of Maryland, 15 November 2013.

*Twisted  $K$ -theory and division algebras* at University of Maryland, 15 November 2013.

*Derived algebraic geometry and derived categories of genus 1 curves* at University of Washington, 1 October 2013.

*Derived algebraic geometry and derived categories of genus 1 curves* at University of Nebraska, Lincoln, 12 September 2013.

*Topology and purity for torsors* at Purdue University, 5 September 2013.

*Brauer spaces of commutative ring spectra* at University of California-Riverside, 13 November 2012.

*Maximal orders in unramified division algebras* at Wayne State University, 4 September 2012.

*Maximal orders in unramified division algebras* at UIC, 29 August 2012.

*The period-index problem for topological spaces* at University of Nebraska, Lincoln, 7 November 2011.

*The period-index problem for topological spaces* at University of Washington, 4 October 2011.

*The étale index of division algebras* at Claremont, 16 November 2010.

*Cohomological obstructions for Brauer classes* at USC, 13 September 2010.

*Cohomological obstructions for Brauer classes* at UCLA, 20 January 2010.

*Galois theory for difference equations with difference parameters* at the Kolchin Seminar at CUNY, 30 October 2009.

## Conference organization

Co-organizer of “Vitamin  $K_1$ : Kerz–Strunk–Tamme”, a workshop dedicated to the proof of Weibel’s conjecture, 30 May to 1 June 2018, UIC.

Co-organizer of a summer school on “Trace methods in algebraic  $K$ -theory,” 7–11 August 2017, Indiana University.

Co-organizer of a summer school on “Topological approaches to algebraic and arithmetic geometry,” September 2016, University of Georgia.

Co-organizer of a summer school on algebraic topology, 25–29 July 2016, University of Chicago.

Co-organizer of a summer school on “Unstable motivic homotopy theory,” 10–12 June 2016 in Münster, Germany.

Co-organizer of the Midwest Topology Seminar on 28 February 2015 at UIC.

Co-organizer of a special session entitled “Brauer groups and Galois cohomology” at the AMS Southeastern Spring Section Meeting of the AMS in Knoxville, TN in March 2014.

## Service to the profession

Mentor for the Bootcamp for the 2015 Algebraic Geometry Summer Research Institute, University of Utah, July 2015.

Lecturer for the School on derived algebraic geometry with a focus on derived symplectic techniques, Warwick, April 2015.

Referee (25 papers), including for *Advances in Mathematics*, *Algebra & Number Theory*, *Annales scientifiques de l’ENS*, *Forum of Mathematics: Sigma*, *Journal of Algebraic Geometry*, *Journal of Topology*, and *Bulletin of the LMS*.

Quick reporter (10 papers).

Reader (2 books), for Cambridge University Press.

Reviewer for MathSciNet (10 reviews).

Panelist for NSF (one panel).

Outside reviewer for an NSA grant application.

Contributor to the open-source math software system SAGE (4 refereed patches).

## Advising

Xing Gu, PhD 2017, co-advised with Brooke Shipley. Currently a postdoc at Melbourne.

Tasos Moulinos, PhD 2018, co-advised with Brooke Shipley. Currently a postdoc in Toulouse.

Jānis Lazovskis, PhD expected 2019.

Victor Jatoba, PhD expected 2019.

Harry Smith, PhD expected 2020.

Joel Stapleton, PhD expected 2020.

## Service to the department

Co-founder and first director of the Mathematical Computing Laboratory at UIC, 2015-present.

Organizer of the Algebraic  $K$ -Theory Seminar (previously the Homotopy Theory Seminar), 2014-present.

Current advisor of Victor Jatoba, Jānis Lazovskis, Tasos Moulinos, Harry Smith, and Joel Stapleton.

Past advisor of Xing Gu (PhD 2017).

Faculty Mentor for Harry Smith, Maximilien Holmberg-Peroux and Jack Hafer.

Mentor for independent studies.

Served on tenure-track hiring committee, 2017-18.

Served on the salary committee, 2016-17.

Served on the postdoc hiring committee, the graduate admissions committee, and the graduate studies committee, 2016-17.

Served on the postdoc hiring committee, the graduate admissions committee, and the graduate studies committee, 2015-16.

Served on the postdoc hiring committee, the graduate admissions committee, and the graduate studies committee, 2014-15.

## Teaching Awards

2018 Honoring Our Professors' Excellence (HOPE) Award, UIC.

## Teaching

2018 Math 547, Algebraic topology I, spring semester, UIC.

2018 Math 548, Algebraic topology II, spring semester, UIC.

2017 Math 300, Writing for mathematics, fall semester, UIC.

2017 Math 215, Introduction to advanced mathematics, fall semester, UIC.

2016 Math 215, Introduction to advanced mathematics, fall semester, UIC.

2016 Math 268, Topics in algebraic topology: rational homotopy theory, UIC, 12 students.

2015 Math 215, Introduction to advanced mathematics, fall semester, UIC, 24 students.

2015 Math 548, Algebraic topology 2, spring semester, UIC, 10 students.

2014 Math 313, Real analysis 1, fall semester, UIC, 13 students.

2014 Matrix algebra, spring quarter, UW, 2 sections totaling 95 students.

2013 Linear analysis, fall quarter, UW, 3 sections totaling 110 students.

2013 Abstract algebra, summer quarter, UCLA, 25 students.



2013 Linear algebra, summer quarter, UCLA, 60 students.  
2013 Real analysis 3, spring quarter, UCLA, 35 students.  
2013 Calculus 2: integration and infinite series, winter quarter, UCLA, 220 students.  
2012 Real analysis 1, fall quarter, UCLA, 40 students.  
2012 Complex analysis, spring quarter, UCLA, 40 students.  
2012 Honors linear algebra, winter quarter, UCLA, 15 students.  
2011 Calculus 2: integration and infinite series, fall quarter, UCLA, 160 students.  
2011 Discrete mathematics, spring quarter, UCLA, 130 students.  
2011 Abstract linear algebra 2, winter quarter, UCLA, 30 students.  
2010 Abstract linear algebra 1, fall quarter, UCLA, 40 students.  
2008 Intermediate algebra, summer semester, UIC, 20 students.  
2007-2010 Various TA and grading duties while a graduate student, UIC.

## Service to the university

Reviewer for Chancellor's Award, 1 grant, 2016.

Interviewed one candidate for Director of Faculty Research Activity in LAS, January 2017.