

# ANDREI CĂLDĂRARU

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**Work Address**

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University of Wisconsin-Madison  
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**AREAS OF INTEREST**

**Algebraic Geometry, String Theory, Homological Algebra**

**POSITIONS HELD**

<b>Professor</b> <i>University of Wisconsin-Madison, WI</i>	2012---present
<b>Visiting Invited Professor</b> <i>Max Planck Institute for Mathematics, Bonn, Germany</i>	Fall 2012
<b>Tenured Associate Professor</b> <i>University of Wisconsin-Madison, WI</i>	2008---2012
<b>Tenure Track Assistant Professor</b> <i>University of Wisconsin-Madison, WI</i>	2005---2008
<b>NSF Postdoctoral Fellow/University Lecturer</b> <i>University of Pennsylvania, Philadelphia, PA</i>	2002---2005
<b>Visiting Assistant Professor</b> <i>University of Massachusetts, Amherst, MA</i>	2000---2002

**EDUCATION**

<b>Ph.D. (Mathematics)</b> <i>Cornell University, Ithaca, NY</i> Areas of interest: algebraic geometry, string theory.	May 2000
<b>Master of Science (Computer Science)</b> <i>Cornell University, Ithaca, NY</i> Concentrations: theoretical computer science and cryptography.	May 2000
<b>Bachelor of Science (Mathematics and Computer Science)</b> <i>Hebrew University, Jerusalem, Israel</i> Graduated Summa Cum Laude with a double major in mathematics and computer science.	July 1993

**PH. D. THESIS**

**Derived categories of twisted sheaves on Calabi-Yau manifolds**  
*(Cornell University, 2000)*

*Thesis advisor:* **Dr. Mark Gross** (currently Professor at Cambridge University, England)

<b>AWARDS</b>	<b>NSF Research Grant 1811925 (\$250,000)</b> <i>Research grant for travel, visitors, research expenses, and summer salary.</i>	2018—2021
	<b>University of Wisconsin Graduate School Grant (\$23,466)</b> <i>Provides summer salary and graduate student support</i>	2009
	<b>Short term visitor, Institute for Advanced Studies</b> <i>“Homological Mirror Symmetry” special year program.</i>	Fall 2016
	<b>Honorary foreign member, Geometry and Physics group</b> <i>GAP group of the Romanian Academy of Sciences</i>	Fall 2015—present
	<b>University of Wisconsin Graduate School Grant (\$17,000)</b> <i>Research grant.</i>	Summer 2016
	<b>NSF Research Training Groups Grant 1502553 (\$2,000,000)</b> <i>Algebraic Geometry, Number Theory and Applied Algebra</i> <i>co-PI with Nigel Boston.</i>	2015-2020
	<b>NSF Research Grant 1200721 (\$220,178)</b> <i>Research grant for travel, visitors, research expenses, and summer salary.</i>	2012—2018
	<b>NSA Mathematical Sciences Program</b> <i>Standard Research Grant (awarded, unable to accept due to conflict with NSF).</i>	2012
	<b>NSF Research Training Groups Grant 0838210 (\$1,297,349)</b> <i>Algebraic Geometry and Number Theory at the University of Wisconsin</i> <i>co-PI with Jordan Ellenberg.</i>	2011-2014
	<b>NSF Research Grant 0901224 (\$216,342)</b> <i>Research grant for travel, visitors, research expenses, and summer salary.</i>	2009-2012
	<b>University of Wisconsin Graduate School Grant</b> <i>Research grant (awarded, unable to accept due to conflict with NSF).</i>	2009
	<b>NSF Research Grant 0556042 (\$257,926)</b> <i>Research grant for travel, visitors, research expenses, and summer salary.</i>	2006-2009
	<b>NSF Postdoctoral Research Fellowship 0202567 (\$108,000)</b> <i>Research grant for travel, visitors, research expenses, and summer salary.</i>	2002-2005
	<b>Intel Prize</b> <i>Awarded to outstanding students at the Hebrew University.</i>	Summer 1993
	<b>Amirim Fellowship</b> <i>Hebrew University, Jerusalem, Israel</i>	1991-1993
	<b>Silver Medal, International Computer Science Olympiad</b> <i>Part of Romania’s team at the second International Computer Science Olympiad held in Minsk, USSR.</i>	Spring 1990

**PUBLICATIONS**

- 1. On the cohomology of the Bridgeland differential**  
(with Dima Arinkin), in preparation
- 2. An HKR decomposition for Azumaya orbifolds,**  
(with Dima Arinkin), in preparation
- 3. Higher genus categorical Gromov-Witten invariants**  
(with Junwu Tu), submitted, (arXiv:1706.09912), 44pp
- 4. On intersections of two Grassmannians in  $\mathbf{P}^9$**   
(with Lev Borisov and Alex Perry), to appear, J. reine angew. Math., (arXiv:1707.00534)
- 5. GLSM realizations of maps and intersections of Grassmannians and Pfaffians**  
(with Johanna Knapp and Eric Sharpe), J. High Energ. Phys. (2018) 2018: 119
- 6. Formality of derived intersections and the orbifold HKR isomorphism**  
(with Dima Arinkin and Márton Hablicsek), to appear, J. Algebra, (arXiv:1412.5233), 23pp
- 7. The Hodge theorem as a derived self-intersection**  
(with Dima Arinkin and Márton Hablicsek)  
Algebraic Geometry 4 (2017), 394-423
- 8. On the Lie algebroid of a derived self-intersection**  
(with Damien Calaque and Junwu Tu), Adv. in Math. 262 (2014), 751-783
- 9. Curved A-infinity algebras and Landau-Ginzburg models**  
(with Junwu Tu), New York J. Math. 19 (2013), 305-342
- 10. PBW for an inclusion of Lie algebras**  
(with Damien Calaque and Junwu Tu), J. Algebra 378 (2013), 64-79
- 11. When is the self-intersection of a subvariety a fibration?**  
(with Dima Arinkin), Adv. in Math., 231 (2012), no. 2, 815-842
- 12. Non-birational twisted derived equivalences in abelian GLSMs**  
(with Jacques Distler, Simeon Hellerman, Tony Pantev and Eric Sharpe)  
Communications in Mathematical Physics 294 (2010), no. 3, 605-645
- 13. The Mukai pairing, I: a categorical approach**  
(with Simon Willerton), New York J. of Math., no. 16 (2010), 61-98
- 14. The Pfaffian-Grassmannian derived equivalence**  
(with Lev Borisov), J. Algebraic Geom. 18 (2009) 201-222
- 15. Non-birational Calabi-Yau threefolds that are derived equivalent**  
Internat. J. Math. 18 (2007), No. 5, 491-504
- 16. Derived categories: a skimming**  
Snowbird Lectures in Algebraic Geometry, Contemporary Mathematics no. 388 (2005),  
43-75
- 17. The Mukai pairing, II: the Hochschild-Kostant-Rosenberg isomorphism**  
Adv. in Math., 194 (2005), no. 1, 34-66
- 18. The Mukai pairing, I: the Hochschild structure**  
preprint math.AG/0308079, superseded by paper 12. above
- 19. Algebraic deformations arising from orbifolds with discrete torsion**  
(with Anthony Giaquinto, Sarah Witherspoon)  
J. Pure Appl. Algebra, **187** (2004), no. 1-3, 51-70

**20. D-Branes, B-fields, and Ext groups**

(with Sheldon Katz, Eric Sharpe), *Adv. Theor. Math. Phys.*, 7 (2003), no. 3, 381-404

**21. Fiberwise stable bundles on elliptic fibrations with relative Picard number one**

*CR Acad. Sci. Paris Ser. I*, 334 (2002), no. 6, 469-472

**22. Non-fine moduli spaces of sheaves on K3 surfaces**

*Internat. Math. Res. Notices* 2002 (2002), no. 20, 1027-1056

**23. Derived categories of twisted sheaves on elliptic threefolds**

*J. reine angew. Math. (Crelle's Journal)* 544 (2002), 161-179

**24. Derived categories of twisted sheaves on Calabi-Yau manifolds**

Ph.D. thesis, Cornell University, (2000)

**PUBLICATIONS  
COMPLETED BY  
PH.D.**

**STUDENTS  
UNDER  
SUPERVISION**

**1. Nicolas Addington, Spinor sheaves on singular quadrics**, *Proc. Amer. Math. Soc.* 139 (2011), no. 11, 3867–3879

**2. Nicolas Addington, The Derived Category of the Intersection of Four Quadrics**, preprint arXiv:0904.1764

**3. Junwu Tu, Matrix factorizations via Koszul duality**, preprint arXiv:1009.4151

**CONFERENCES  
ORGANIZED**

**Homological Methods in Algebraic Geometry** (with Dima Arinkin) April 2014  
*University of Wisconsin, Madison*

**Mirror Symmetry in the Midwest** (with Yong-Geun Oh) November 2012  
*University of Wisconsin, Madison*

**Midwest Algebraic Geometry Graduate Conference** October 2010  
*University of Wisconsin, Madison*

**SELECTED  
INVITED  
LECTURES**

**Algebraic Geometry seminar** April 2018  
*Stanford University, Palo Alto, CA*

**Spring School “Categorical Gromov-Witten invariants” (lead)** March 2018  
*Castello di Montegufoni, Italy*

**Algebraic Geometry Seminar** November 2017  
*RIMS (Research Institute in Mathematical Sciences), Kyoto, Japan*

**Math-String Seminar** November 2017  
*IPMU (Institute for the Physics and Mathematics of the Universe), Tokyo, Japan*

**Algebraic Geometry Seminar** November 2017  
*Northwestern University, Evanston, IL*

**AMS Sectional Meeting** September 2017  
*University at Buffalo, Buffalo, NY*

**Enumerative Geometry, Mirror Symmetry, and Physics** July 2017  
*University of Illinois at Urbana-Champaign*

**Symplectic Geometry Seminar** April 2017  
*Institute for Advanced Studies, Princeton, NJ*

**Winter school “Higher Categories and TQFT” (primary lecturer)** December 2016  
*KLAS, South Korea*

**I-70 Algebraic Geometry Symposium (plenary speaker)** November 2016  
*University of Missouri, Columbia*

**INVITED  
LECTURES  
(CONT'D)**

<b>Workshop on String/M-theory</b> <i>Fields Institute, Toronto, Canada</i>	August 2016
<b>Interacting Algebraic Geometry</b> <i>Institut de Mathématiques de Bourgogne, Dijon, France</i>	July 2016
<b>Factorization Algebras and Functorial Field Theory</b> <i>Mathematisches Forschungsinstitut Oberwolfach, Germany</i>	May 2016
<b>Algebraic Geometry seminar</b> <i>Northeastern University, Boston, MA</i>	November 2015
<b>AMS Sectional Meeting</b> <i>Loyola University, Chicago, IL</i>	October 2015
<b>AMS Summer Institute in Algebraic Geometry</b> <i>University of Utah, Salt Lake City, UT</i>	July 2015
<b>Eighth Congress of Romanian Mathematicians</b> <i>Iasi, Romania</i>	July 2015
<b>GAP XIII, Derived Geometry conference</b> <i>IBS Center for Geometry and Physics, Pohang, Korea</i>	July 2015
<b>Algebraic Geometry seminar</b> <i>Hebrew University, Jerusalem, Israel</i>	June 2015
<b>Spring Eastern regional AMS conference</b> <i>Georgetown University, Washington, DC</i>	March 2015
<b>Mathematics Inspired by String Theory</b> <i>Tsinghua Sanya Mathematical Forum, Sanya, China</i>	December 2014
<b>Higher Structures in Philadelphia conference</b> <i>Temple University, Philadelphia, PA</i>	August 2014
<b>Algebraic Geometry Summer Days</b> <i>Institute of Mathematics of the Romanian Academy, Bucharest, Romania</i>	June 2014
<b>Deformation Theory and Topology seminars</b> <i>University of Pennsylvania and New York University</i>	April 2014
<b>Geometry Seminar</b> <i>University of British Columbia, Vancouver, Canada</i>	March 2014
<b>Algebraic Analysis and Deformation Quantization conference</b> <i>University of Padova, Padova, Italy</i>	February 2014
<b>Higher Categories and Topological Field Theories conference</b> <i>Erwin Schrödinger Institute, Vienna, Austria</i>	June 2013
<b>Moduli Spaces and their Invariants in Mathematical Physics</b> <i>Centre de Recherche Mathématiques, Montréal, Canada</i>	June 2013
<b>Cornell-PSU Symplectic Geometry seminar</b> <i>Penn State University, State College, PA</i>	April 2013
<b>Various Geometry Seminars</b> <i>ETH Zurich, EPFL Lausanne, Oxford University, Max Planck Institute Bonn, University of Amsterdam, IMAR Bucharest</i>	Sept-Dec 2012

<b>Syzgies in Algebraic Geometry, with an exploration of a Connection with String Theory</b> <i>Banff International Research Station, Banff, Canada</i>	August 2012
<b>Spring School on Algebraic Microlocal Analysis</b> <i>Northwestern University, Evanston, IL</i>	May 2012
<b>Colloquium and Algebra Seminar</b> <i>University of Maryland, College Park, MD</i>	May 2012
<b>Conference in Honor of Ragnar-Olaf Buchweitz</b> <i>University of Syracuse, Syracuse, NY</i>	April 2012
<b>Hyperkahler and holomorphic symplectic geometry</b> <i>BIRS, Banff, Canada</i>	March 2012
<b>Algebraic Geometry Seminar</b> <i>Princeton University, Princeton, NJ</i>	February 2012
<b>Algebraic Analysis Seminar</b> <i>Université Paris 7, Paris, France</i>	November 2011
<b>Mirror Symmetry in the Midwest</b> <i>Kansas State University, Manhattan, KS</i>	November 2011
<b>Colloquium and Algebraic Geometry Seminar</b> <i>University of Utah, Salt Lake City, UT</i>	October 2011
<b>Seventh International Congress of Romanian Mathematicians</b> <i>Brason, Romania</i>	August 2011
<b>The Legacy of Deformation Quantization</b> <i>ETH, Ascona, Switzerland</i>	July 2011
<b>Loop Algebras, Groups, and Spaces</b> <i>CIRM Luminy, Marseille, France</i>	June 2011
<b>Colloquium and Algebraic Geometry Seminar</b> <i>University of North Carolina, Chapel Hill, NC</i>	March 2011
<b>Western Algebraic Geometry Seminar</b> <i>University of Arizona, Tucson, AZ</i>	November 2010
<b>ETH Zurich Mathematics Colloquium</b> <i>ETH Zurich, Zurich, Switzerland</i>	October 2010
<b>AMS Sectional Meeting</b> <i>Macalester College, St. Paul, MN</i>	April 2010
<b>Mirror Symmetry and Gromov-Witten Theory</b> <i>NIMS, Seoul National University, Seoul, South Korea</i>	January 2010
<b>Mirror Symmetry and Gromov-Witten Invariants</b> <i>University of Tokyo, Tokyo, Japan</i>	December 2009
<b>Algebraic Geometry and Lie Theory Seminar</b> <i>University of California, Riverside, CA</i>	November 2009
<b>Oliver Club Lecture (Mathematics Department Colloquium)</b> <i>Cornell University, Ithaca, NY</i>	November 2009

**GRADUATE AND  
POSTDOC  
ADVISING**

**Graduate Students**

Nicolas Addington – Ph.D. received 12/2009, tenure-track University of Oregon  
Junwu Tu – Ph.D. received 08/2011, tenure-track University of Missouri, Columbia  
Márton Hablicsek – Ph.D. received 06/2014, post-doc University of Pennsylvania  
Ahmet Kabakulak – Ph.D. received 06/2017, currently at Amazon.com  
Shengyuan Huang – Ph.D. expected 06/2020  
Weng-Him Cheung – Ph.D. expected 06/2021  
David Wagner – Ph.D. expected 06/2021

**Postdocs Advised and Current Position**

Sukhendu Mehrotra (2009-2011), tenure-track Pontificia Universidad Catolica de Chile  
Matthew Ballard (2011-2013), tenure-track University of South Carolina  
Parker Lowrey (UW-Madison, 2013-2014), Senior Data Scientist, Activision  
Alexander Pavlov (2016-present)  
Michael Brown (2017-present)

**TEACHING  
EXPERIENCE**

**Lead Lecturer: Categorical Gromov-Witten invariants**

March 2018

*Castello di Montegufoni, Italy (organized by the University of Mainz)*

Along with Timothy Perutz, presented a five lecture series aimed at post-doctoral fellows and graduate students.

**Lecture Series: Gromov-Witten Invariants of  $A_\infty$  Categories**

January 2010

*Chinese University of Hong Kong, Hong Kong*

Presented a six lecture series aimed at post-doctoral fellows and graduate students.

**Instructor**

June 2009

*University of Pennsylvania summer school on Geometry of Quantum Fields And Strings*

One of the primary instructors for the summer school, which was aimed at introducing graduate students and post-doctoral fellows to advanced topics in string theory and mirror symmetry

**Instructor**

June 2007

*University of Utah summer school on Derived Categories*

One of the primary instructors for the summer school, which was aimed at introducing graduate students and post-doctoral fellows to advanced topics in derived categories and physics

**Assistant Professor/Associate Professor/Professor**

2005-present

*University of Wisconsin-Madison*

Professor for courses at all levels, from large introductory courses for undergraduate students to advanced graduate courses

**SERVICE****Organizer**

Algebraic Geometry Seminar – UW-Madison (2005 – present)

Putnam Club – UW-Madison 2009-2010

**NSF Panel member**

Evaluating proposals submitted to the NSF Algebra Section – January 2008, January 2009, January 2010, December 2010, February 2014; and for Career proposals October 2017.

**Referee**

Various journals, including *Inventiones Mathematicae*, *Duke Mathematical Journal*, *Advances in Mathematics*, *Communications in Mathematical Physics*

**Committee Member (UW-Madison)**

Physical sciences divisional committee – 2013-2016, fall 2017

University senator – 2010-2012

Salary committee – 2013, 2014-2017 (chair)

Budget committee – 2017-present

Algebra caucus chair – 2014

Undergraduate program committee – 2005-2008

TA evaluation committee – 2011-2012

Director of computing search committee – 2011

Graduate and undergraduate advisor – 2011-present