

SEBASTIAN CASALAINA-MARTIN

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APPOINTMENTS

University of Colorado

Associate Professor, 2015–present.
Assistant Professor, 2008–15.

Harvard University

NSF Postdoctoral Research Fellowship, 2005–2008.

Stony Brook University

Simons Instructor, 2004–2007.

EDUCATION

Columbia University

Ph.D., Mathematics, 2004. Advisor: Robert Friedman.
M.Phil., Mathematics, 2004.
M.A., Mathematics, 2000.

Brown University

B.Sc., Mathematics, *Honors*, 1998.

VISITING POSITIONS

Leibniz University Hannover

Riemann Fellow, Fall 2017.

Mathematical Sciences Research Institute

Postdoctoral Fellow, Spring 2009.

GRANTS AND AWARDS

- PI on **Simons Foundation** Collaboration Grant for Mathematicians #581058, 2018–2023.
- PI on **NSA** Standard Grant H98230-16-1-0053, 2016–2018.
- **Simons Foundation** Collaboration Grant for Mathematicians #317572, 2014–2016.
- PI on **NSF** Standard Grant DMS-11-01333, 2011–14.
- **NSF** Postdoctoral Research Fellowship DMS-05-03228, 2005–2008.
- Co-PI on **NSF** Seminar Grants DMS-16-36713 (2016–2019), DMS-15-02166 (2015), DMS-09-55038 (2010–15), DMS-0951907 (2009).

RESEARCH

I am an algebraic geometer with a broad range of interests. My research focuses on curves, abelian varieties, cubic threefolds, vector bundles and moduli spaces.

PUBLICATIONS

All publications are available online at <http://math.colorado.edu/~casa>

1. J. Achter, S. Casalaina-Martin, and C. Vial, *Algebraically motivated normal functions are algebraic*, preprint. [arXiv:1810.07404]
2. J. Achter, S. Casalaina-Martin, and C. Vial, *Derived equivalent threefolds, algebraic representatives, and the coniveau filtration*, to appear in the Mathematical Proceedings of the Cambridge Philosophical Society. [arXiv:1704.01902]
3. J. Achter, S. Casalaina-Martin, and C. Vial, *Distinguished models of intermediate Jacobians*, to appear in Journal of the Institute of Mathematics of Jussieu. [arXiv:1611.07471]
4. J. Achter, S. Casalaina-Martin and C. Vial, *Parameter spaces for algebraic equivalence*, to appear in IMRN. [arXiv:1610.06586]
5. S. Casalaina-Martin, S. Grushevsky, K. Hulek and R. Laza, *Complete moduli of cubic threefolds and their intermediate Jacobians*, preprint. [arXiv:1510.08891]
6. J. Achter, S. Casalaina-Martin, K. Honigs and C. Vial, *Derived equivalent varieties have isogenous Picard varieties; appendix to Derived equivalence, Albanese varieties, and the zeta functions of 3-dimensional varieties*, by K. Honigs, Proc. Amer. Math. Soc. **146** (2018), no. 3, 1005–10013. [arXiv:1604.00042]
7. S. Casalaina-Martin, M. Popa and S. Schreieder, *Generic vanishing and minimal cohomology classes on abelian fivefolds*, J. Algebraic Geom. **27** (2018), no. 3, 553–581. [arXiv:1602.06231]
8. S. Casalaina-Martin and J. Wise, *An introduction to moduli stacks, with a view towards Higgs bundles on algebraic curves*. The geometry, topology and physics of moduli spaces of Higgs bundles, 199–399, Lect. Notes Ser. Inst. Math. Sci. Natl. Univ. Singap., 36, World Sci. Publ., Hackensack, NJ, 2018. [arXiv:1708.08124]
9. J. Achter, S. Casalaina-Martin and C. Vial, *On descending cohomology geometrically*, Compositio Math. **153** (2017), no. 7, 1446–1478. [arXiv:1410.5376]
10. S. Casalaina-Martin, J. Kass and F. Viviani, *The singularities and birational geometry of the universal compactified Jacobian*, Algebraic Geometry **4** (2017), no. 3, 353–393. [arXiv:1408.3494]
11. S. Casalaina-Martin, S. Grushevsky, K. Hulek and R. Laza, *Extending the Prym map to toroidal compactifications of the moduli space of abelian varieties*, (with an appendix by Mathieu Dutour Sikiric), J. Eur. Math. Soc. (JEMS) **19** (2017), no. 3, 659–723. [arXiv:1403.1938]

12. S. Casalaina-Martin, J. Kass and F. Viviani, *The local structure of compactified Jacobians*, Proc. Lond. Math. Soc. **110** (2015), no. 2, 510–542. [arXiv:1107.4166]
13. S. Casalaina-Martin, D. Jensen and R. Laza, *Log canonical models and variation of GIT for genus four canonical curves*, J. Algebraic Geom. **23** (2014), no. 4, 727–764. [arXiv:1203.5014]
14. S. Casalaina-Martin, *A tour of stable reduction with applications*, A celebration of algebraic geometry, 65–117, Clay Math. Proc., **18**, Amer. Math. Soc., Providence, RI, 2013. [arXiv:1207.1048]
15. S. Casalaina-Martin, J. Kass and F. Viviani, *The geometry and combinatorics of cographic toric face rings*, Algebra and Number Theory **7** (2013), no. 8, 1781–1815. [arXiv:1102.2547]
16. S. Casalaina-Martin and R. Laza, *Simultaneous semi-stable reduction for curves with ADE singularities*, Trans. Amer. Math. Soc. **365** (2013), no. 5, 2271–2295. [arXiv:1007.0265]
17. S. Casalaina-Martin, D. Jensen and R. Laza, *The geometry of the ball quotient model of the moduli space of genus four curves*, Compact Moduli Spaces and Vector Bundles, 107–136, Contemp. Math., **564**, Amer. Math. Soc., Providence, RI, 2012. [arXiv:1109.5669]
18. S. Casalaina-Martin and J. Kass, *A Riemann singularity theorem for integral curves*, Amer. J. Math. **134** (2012), no. 5, 1143–1165. [arXiv: 0907.0212]
19. S. Casalaina-Martin and M. Teixidor i Bigas, *Singularities of Brill-Noether loci for vector bundles on curves*, Math. Nach. **284** (2011), no. 14-15, 1846–1871. [arXiv:0710.2480]
20. S. Casalaina-Martin and R. Laza, *The moduli space of cubic threefolds via degenerations of the intermediate Jacobian*, J. Reine Angew. Math. (Crelle) **633** (2009), 29–65. [arXiv:0710.5329]
21. S. Casalaina-Martin, T. Gwena, and M. Teixidor i Bigas, *Some examples of vector bundles in the base locus of the generalized theta divisor*, C. R. Math. Acad. Sci. Paris **347** (2009), no. 3-4, 173–176. [arXiv:0707.2326]
22. S. Casalaina-Martin, *Singularities of the Prym theta divisor*, Ann. of Math. **170** (2009), no. 1, 163–204. [arXiv:math/0405195]
23. S. Casalaina-Martin, M. Lahoz and F. Viviani, *Cohomological support loci for Abel-Prym curves*, Matematiche (Catania) **63** (2008), no. 1, 205–222. [arXiv:0802.3683]
24. S. Casalaina-Martin, *Singularities of theta divisors in algebraic geometry*, Curves and abelian varieties, 25–43, Contemp. Math., **465**, Amer. Math. Soc., Providence, RI, 2008. [arXiv:1207.1042]
25. S. Casalaina-Martin, *Cubic threefolds and abelian varieties of dimension five. II*, Math. Z. **260** (2008), no. 1, 115–125. [arXiv:math/0605666]

26. S. Casalaina-Martin and R. Friedman, *Cubic threefolds and abelian varieties of dimension five*, J. Algebraic Geom. **14** (2005), no. 2, 295–326. [arXiv:math/0307015]

PRESENTATIONS

- Texas A&M, *Texas Algebraic Geometry Seminar (TAGS)*, November 2018.
- Texas A&M, *Geometry seminar*, November 2018.
- Cetraro, Italy, *Differential, Algebraic and Topological Methods in Complex Algebraic Geometry*, September 2018.
- Leibniz Universität Hannover, Germany, *Workshop on Arithmetic and Geometry of Cubic Hypersurfaces*, August 2018.
- University of Missouri, St. Louis, *Colloquium*, March 2018.
- Washington University, St. Louis, *Algebraic Geometry Seminar*, March 2018.
- University of Barcelona, Spain, *Workshop on Complex Algebraic Geometry – Pirola 60th*, February 2018.
- Humboldt Universität zu Berlin, Germany, *North German Algebraic Geometry Seminar*, November 2017.
- Stony Brook University, *Algebraic Geometry Seminar*, October 2017.
- Università Roma Tre, Italy, *Seminari di Geometria*, October 2017.
- Universität Bielefeld, Germany, *Arithmetic Geometry Seminar*, October 2017.
- Columbia University, *Algebraic Geometry Seminar*, September 2017.
- NYU, *Algebraic Geometry Seminar*, September 2017.
- Boston College, *Number Theory and Algebraic Geometry Seminar*, April 2017.
- Jeju, Korea, *Conference On Moduli and Birational Geometry V*, December 2016.
- International Centre for Theoretical Physics, Trieste, Italy, *Advanced School and Workshop on Moduli Spaces, Mirror Symmetry and Enumerative Geometry*, August 2016.
- Leibniz Universität Hannover, Germany, *Algebraic Geometry Seminar*, June 2016.
- Cambridge University, UK, *Algebraic Geometry Seminar*, June 2016.
- University of Utah, *AMS Summer Institute in Algebraic Geometry*, July 2015.
- Stony Brook University, *New Techniques in Birational Geometry*, April 2015.
- Institute for Advanced Study (IAS), Princeton, *Topology of Algebraic Varieties*, January 2015.
- University of Utah, *Algebraic Geometry Seminar*, December 2014.

- National University of Singapore, Institute of Mathematical Sciences, *Workshop on the Geometry, Topology and Physics of Moduli Spaces of Higgs Bundles*, July 2014.
- Humboldt Universität zu Berlin, Germany, *Forschungsseminar Algebraische Geometrie*, June 2014.
- Università Roma Tre, Italy, *Seminari di Geometria*, June 2014.
- University of Northern Texas, *Colloquium*, March 2014.
- Stony Brook University, *Algebraic Geometry Seminar*, October 2013.
- Boston College, *Number Theory and Algebraic Geometry Seminar*, October 2013.
- POSTECH, Korea, *Conference on Moduli and Birational Geometry IV*, August 2013.
- San Diego, CA, *Singularities in Geometry and Algebra*, Special Session of the AMS joint meeting, January 2013.
- Mathematisches Forschungsinstitut Oberwolfach, Germany, *Komplexe Analysis*, September 2012,
- Busan, Korea, *Workshop on Moduli and Birational Geometry*, July 2012.
- University of Georgia, *Georgia Algebraic Geometry Symposium*, May 2012.
- University of Washington, *Algebraic Geometry Seminar*, March, 2012.
- National University of Singapore, *Topology and Geometry Seminar*, November 2011.
- Salt Lake City, Utah, *Algebraic Geometry*, Special Session of the AMS meeting, October 2011.
- Maresias, Brazil, *11th Meeting on Algebraic Geometry and Commutative Algebra*, October 2011.
- Colorado State University, *Rocky Mountain Algebraic Combinatorics Seminar*, September 2011.
- CUNY Graduate Center, *Commutative Algebra and Algebraic Geometry Seminar*, November 2010.
- University of Washington, *Colloquium*, October 2010.
- University of British Columbia–University of Washington, *Algebraic Geometry Seminar*, October 2010.
- KIAS, Korea, *Algebraic Geometry Seminar*, August 2010.
- POSTECH, Korea, *Workshop on Moduli and Birational Geometry*, August 2010.
- IMPA, Brazil, *10th Meeting on Algebraic Geometry and Commutative Algebra*, July 2010.
- Stony Brook University, *Seminar on Algebra, Geometry, and Physics*, May 2010.
- University of Colorado, *Great Plains Operator Theory Special Year One Day Conference*, November 2009.

- University of California at San Diego, *Algebraic Geometry Seminar*, October 2009.
- Columbia University, *Algebraic Geometry Seminar*, September 2009.
- California Polytechnic State University, *Colloquium*, May 2009.
- University of British Columbia, Canada, *Algebraic Geometry Seminar*, April 2009.
- University of Utah, *Western Algebraic Geometry Seminar (WAGS)*, November 2008.
- Colorado State University, *Algebra Seminar*, October 2008.
- University of Illinois at Chicago, *Algebraic Geometry Seminar*, October 2008.
- University of North Carolina, *Colloquium*, February 2008.
- Texas A&M University, *Colloquium*, February 2008.
- Stanford University, *Algebraic Geometry Seminar*, February 2008.
- University of California at Santa Cruz, *Colloquium*, January 2008.
- Rutgers University, *Colloquium*, January 2008.
- University of Toronto, Canada, *Colloquium*, January 2008.
- Harvard University, *Algebraic Geometry Seminar*, December 2007.
- CUNY, Lehman College, *Colloquium*, December 2007.
- University of California at Irvine, *Colloquium*, November 2007.
- University of Georgia, *Curves, abelian varieties, and their interactions; on the occasion of the 65th birthday of Roy Smith*, April 2007.
- University of Michigan, *Algebraic Geometry Seminar*, March 2007.
- Brown University, *Algebraic Geometry Seminar*, March 2007.
- Boston University, *Geometry Seminar*, April 2006.
- University of Chicago, *Algebraic Geometry Seminar*, December 2005.
- Harvard University, *Algebraic Geometry Seminar*, March 2005.
- Stony Brook University, *Algebraic Geometry Seminar*, September 2004.
- Salamanca, Spain, *III Iberoamerican conference on geometry*, June 2004.
- Columbia University, *Algebraic Geometry Seminar*, April 2004.

TEACHING

1. *Calculus 2*, Fall 2018 (University of Colorado). A second semester undergraduate calculus course. Lectured and served as course coordinator for 16 sections with over 400 students in total, 10 graduate student instructors, 1 instructor, 6 graduate student teaching assistants, and 6 undergraduate learning assistants.
2. *Homological algebra*, Spring 2018 (University of Colorado). Graduate course in homological algebra.
3. *Linear algebra*, Spring 2018 (University of Colorado). An undergraduate introduction to linear algebra.
4. *Functions of a complex variable 2*, Spring 2017 (University of Colorado). A graduate course in complex analysis and complex algebraic geometry.
5. *Abstract algebra 2*, Spring 2017 (University of Colorado), An undergraduate course in algebra.
6. *Abstract algebra 1*, Fall 2016 (University of Colorado). An undergraduate course on Groups, Rings and Fields.
7. *Complex analysis*, Spring 2016 (University of Colorado). An undergraduate course on complex analysis.
8. *Intro to discrete mathematics*, Spring 2016 (University of Colorado). An undergraduate course on the language of mathematics and proofs.
9. *Functions of a complex variable 1*, Fall 2015 (University of Colorado). A graduate course on complex analysis.
10. *Complex analysis*, Spring 2015 (University of Colorado). An undergraduate course on complex analysis.
11. *Euclidean and non-Euclidean geometry*, Spring 2015 (University of Colorado). An undergraduate introduction to Euclidean and non-Euclidean geometry.
12. *Commutative algebra*, Fall 2014 (University of Colorado). A graduate introduction to commutative algebra.
13. *Homological algebra*, Spring 2014 (University of Colorado). Graduate course in homological algebra.
14. *Euclidean and non-Euclidean geometry*, Spring 2014 (University of Colorado). An undergraduate introduction to Euclidean and non-Euclidean geometry.
15. *Analysis 1*, Fall 2013 (University of Colorado). An undergraduate introduction to real analysis.
16. *Introduction to linear algebra*, Spring 2013 (University of Colorado). An undergraduate introduction to linear algebra.
17. *Commutative algebra*, Fall 2012 (University of Colorado). A graduate introduction to commutative algebra.
18. *Analytic geometry and calculus 2*, Spring 2012 (University of Colorado). A second semester undergraduate calculus course. Lectured and served as course coordinator for 8 sections with over 200 students in total,

7 graduate student instructors, 1 instructor, 3 graduate student teaching assistants, and 2 undergraduate learning assistants.

19. *Abstract algebra 2*, Spring 2012 (University of Colorado), A second semester undergraduate course in algebra.
20. *Functions of a complex variable 2*, Spring 2011 (University of Colorado). A second semester graduate course in complex analysis.
21. *Abstract algebra 1*, Spring 2011 (University of Colorado). An undergraduate course on Groups, Rings and Fields.
22. *Algebraic geometry*, Spring 2010 (University of Colorado). A graduate introduction to algebraic geometry.
23. *Abstract algebra 1*, Fall 2009, (University of Colorado). An undergraduate course on Groups, Rings and Fields.
24. *Complex analysis*, Fall 2008 (University of Colorado). An undergraduate course on complex analysis.
25. *Abstract algebra 2*, Spring 2010 (University of Colorado), A second semester undergraduate course in algebra.
26. *Introduction to algebraic geometry II: algebraic surfaces*, Spring 2008 (Harvard). A graduate course focusing on the classification of complex algebraic surfaces.
27. *Theory of schemes II*, Spring 2008 (Harvard). The second semester of a one year graduate course focusing on the theory of schemes, sheaves, and sheaf cohomology.
28. *Introduction to curves and abelian varieties*, Fall 2006 (Harvard). A graduate course on algebraic curves and abelian varieties, focusing on the relation between a curve and its Jacobian.
29. *Calculus 1*, Spring 2005 (Stony Brook University). A first semester course in calculus. Served as course coordinator.
30. *Calculus 1*, Fall 2004 (Stony Brook University). A first semester course in calculus.
31. *Linear algebra*, Summer 2004 (Columbia). An undergraduate course in linear algebra.
32. *Calculus IA*, Spring 2003 (Columbia). First semester courses in calculus.
33. *College algebra and analytic geometry*, Fall 2002 (Columbia). A one-semester course of pre-calculus.
34. *College algebra and analytic geometry*, Summer 2002 (Columbia). A one-semester course of pre-calculus.
35. *Basic mathematics*, Spring 2002 (Columbia). A course in elementary mathematics as a preparation for pre-calculus.
36. *Calculus I*, Summer 2001 (Columbia). First semester courses in calculus.

Advising Graduate students towards Ph.D.

- Matthew Grimes (Ph.D. 2016). *Relative moduli of vector bundles and the log-minimal model program on the moduli space of curves* [arXiv: 1409.5734]. Visiting Assistant Professor (postoc) at Boston College 2016–2019. Currently an Associate Data Scientist at The Hartford in Connecticut.
- Krisztian Havasi (Ph.D. 2016). *Geometric realization of strata in the boundary of the intermediate Jacobian locus*. Currently a 3D Modeling Software Engineer in Colorado.
- Josh Frinak (Ph.D. 2018). *Degeneration of Prym Varieties: A computational approach to the indeterminacy locus of the Prym map and degenerations of cubic threefolds*. Currently a Business Analyst at Gaia in Louisville, Colorado

SERVICE

- Co-organizer of the workshop Perspectives on Complex Algebraic Geometry, in honor of Bob Friedman's 60th birthday, May 2015 at Columbia University.
- Co-organizer of the Spring 2014 Western Algebraic Geometry Symposium (WAGS) at the University of Colorado.
- Co-organizer of the Front Range Algebra, Geometry and Number Theory Seminar (FRAGMENT), joint with CSU, Fall 2009-present.
- Co-organizer of the Western Algebraic Geometry Symposium (WAGS) held at CSU in Fall 2011.
- Long-term organizing for the Western Algebraic Geometry Symposium (WAGS), Fall 2009-present.
- Co-organizer of the special session on Algebraic Geometry at the AMS sectional meeting held at the University of Colorado, Spring 2013.
- Organizer of the University of Colorado Department of Mathematics Kempner Colloquium, Fall 2011–Spring 2015.
- Co-organizer of a working seminar on Stacks, Groupoids, and Deformation Theory at the University of Colorado, 2009-2012.
- Committee work (University of Colorado): deLong committee, diversity committee, executive committee, preliminary and comprehensive exam committees, graduate committee, algebra committee, hiring committees. Thesis reader for students at the University of Colorado, Harvard and Tufts.
- Advising of graduate students: Matthew Grimes (Ph.D. 2016), Krisztian Havasi (Ph.D. 2016). Josh Frinak (Ph.D. 2018).
- NSF and NSA grant proposal evaluation.
- Refereed articles for journals including *Compositio Mathematica*, *Journal of Algebraic Geometry*, *Bulletin of the London Mathematics Society*, *Algebra and Number Theory*, *Monatshefte fuer Mathematik*, *IMRN*, *Contemporary Mathematics*, *Documenta Math.*, *Archiv der Math.*, and *Communications in Algebra*.