

## Harold Blum

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Department of Mathematics  
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**RESEARCH INTEREST** My research is in algebraic geometry and its connections with differential geometry and commutative algebra. My current work focuses K-stability, Fano varieties, moduli, singularities, and higher dimensional geometry.

**EMPLOYMENT** **University of Utah, Salt Lake City, UT.** 2022 – present  
Assistant Professor.

**Stony Brook University, Stony Brook, NY.** 2020 – 2022  
NSF Postdoctoral Associate.

**University of Utah, Salt Lake City, UT.** 2018 – 2020  
NSF Postdoctoral Researcher.

**EDUCATION** **University of Michigan, Ann Arbor, MI.** 2012 – 2018  
Ph.D. in Mathematics.  
Advisor: Mircea Mustață.

**Swarthmore College, Swarthmore, PA.** 2008 – 2012  
BA in Mathematics with High Honors.

**PAPERS** *Moduli of boundar polarized Calabi–Yau* (joint w/ K. Ascher, D. Bejlari, K. DeVleming, G. Inchiostro, Y. Liu, and X. Wang), arXiv:2307.06522.

*Convexity of multiplicities of filtrations on local rings* (joint with Yuchen Liu and Lu Qi), arXiv:2208.04902. Accepted for publication at Compos. Math.

*The existence of the Kähler–Ricci soliton degeneration* (joint with Yuchen Liu, Chenyang Xu, and Ziquan Zhuang), Forum Math. Pi **11** (2023), Paper No. e9.

*On properness of K-moduli spaces and optimal destabilizations* (joint with Daniel Halpern-Leistner, Yuchen Liu, and Chenyang Xu), Selecta Math. **27** (2021), 73.

*Optimal destabilization of K-unstable Fano varieties via stability thresholds* (joint with Yuchen Liu and Chuyu Zhou), Geom. Topol. **26** (2022), 2507–2564.

*Openness of K-semistability for Fano varieties* (joint with Yuchen Liu and Chenyang Xu), Duke Math. J. **171** (2022), 2753–2797.

*Reductivity of the automorphism group of K-polystable Fano varieties* (joint with Jarod Alper, Daniel Halpern-Leistner, and Chenyang Xu), Invent. Math. **222** (2020), 995–1032.

*Uniqueness of K-polystable degenerations of Fano varieties* (joint with Chenyang Xu), Ann. of Math. **190** (2019), 609–656.

*Openness of uniform K-stability in families of Q-Fano varieties* (joint with Yuchen Liu), Ann. Sci. Éc. Norm. Supér. **55** (2022), 1–41.

*The normalized volume of a singularity is lower semicontinuous* (joint with Yuchen Liu), J. Eur. Math. Soc. (JEMS) **23** (4), 1225–1256.

*Thresholds, valuations, and K-stability* (joint with Mattias Jonsson), Adv. in Math. **365** (2020), 107062.

*Existence of valuations with smallest normalized volume.* Comp. Math. **154** (2018), 820–849.

*On divisors computing lct's and mld's.* Bull. Korean Math. Soc. **58** (2021), 113–132.

**GRANTS** NSF Mathematical Sciences Standard Grant. 2022 – 2025.

NSF Mathematical Sciences Postdoctoral Research Fellowship. 2018 – 2021

**AWARDS** ICCM Best Paper Award for 2019 paper with C. Xu. (To receive at awards ceremony held in January 2024.) 2023

Utah Mathematics Department Outstanding Postdoc Award. 2020

Michigan Mathematics Department Outstanding Teaching Award. 2016

Phi Beta Kappa Inductee. 2012

**SEMINAR TALKS** Boston College Algebraic Geometry Seminary, October 2023.

U of Missouri Algebra Seminar, March 2023.

Stony Brook Mathematics Colloquium, September 2021.

Princeton Algebraic Geometry Seminar, April 2021.

Utah Mathematics Colloquium, January 2021.

Utah Algebraic Geometry Seminar, January 2021.

UC Berkeley Guest Lecture Series, December 2020.

Stony Brook Algebraic Geometry Seminar, September 2020.

Zoom Algebraic Geometry (ZAG) Seminar, July 2020.

UCLA Algebraic Geometry Seminar, May 2020.

Online Algebraic Geometry Seminar, May 2020.

UCSD Algebraic Geometry Seminar, November 2019.

University of Michigan Algebraic Geometry Seminar, October 2019.

Roma Tre Algebraic Geometry Seminar, March 2019.  
Northwestern Algebraic Geometry Seminar, February 2019.  
Rutgers Newark Department Colloquium, October 2018.  
Harvard/MIT Algebraic Geometry Seminar, October 2018.  
Utah Algebraic Geometry Seminar, September 2018.  
University of Illinois Chicago Algebraic Geometry Seminar, April 2018.  
Utah Algebraic Geometry Seminar, October 2017.  
Stony Brook Algebraic Geometry Seminar, October 2017.  
Princeton Algebraic Geometry Seminar, February 2017.  
Purdue Algebraic Geometry Seminar, October 2016.

**CONFERENCE  
TALKS**

ICCM Annual Conference (Shanghai, China), January 2024 (expected).  
FRG Special Month in Ann Arbor (U of Michigan), May 2023.  
Georgia Algebraic Geometry Symposium (U of Georgia), April 2023.  
Western Algebraic Geometry Symposium (U of Washington), April 2023.  
Explicit Moduli Problems in Higher Dimensions (BIRS, Banff), April 2023. *Two part survey talk on K-stability.*  
Stability and Moduli (Stony Brook, NY), August 2022.  
Moduli Spaces, Birational Geometry and Derived Aspects (Oberwolfach, Germany), July 2022.  
Shokurov Birthday Conference (Johns Hopkins University), May 2022.  
Special Month On Singularities & K-Stability (Salt Lake City, Utah), June 2021.  
Higher dimensional geometry in New York: K-stability (Stony Brook, NY), October 2020.  
Summer school on Fano varieties (Xiamen, China), June 2020.  
K-stability and related topics (American Institute of Mathematics), January 2020.  
Birational geometry, Kähler-Einstein metrics, and degenerations (Moscow, Russia), April 2019.  
AMS Spring Western Sectional, April 2018.

**LECTURE  
SERIES**

School and Workshop on Moduli, K-trivial Varieties, and Related Topics (Daejeo,

South Korea), February 2024 (expected).

Autumn School and Workshop: “Singularities and Torus Actions” (Oldenburg, Germany), September 2023.

Summer school on Fano varieties (Xiamen, China), June 2020.

## TEACHING

### University of Utah

Math 1310 (Engineering Calculus I): Fall 2023.

Math 4400 (Introduction to Number Theory): Fall 2019.

Math 3210 (Foundations of Analysis): Spring 2020, Spring 2022.

Math 5320 (Modern Algebra II): Spring 2023.

Math 7800 (Topics in Algebraic Geometry): Fall 2022.

### University of Michigan

Math 115 (Calculus I), Fall 2012, Winter 2013, Fall 2013, Winter 2014, Fall 2014\*.

Math 116 (Calculus II): Fall 2015, Fall 2016, Fall 2017.

Math 489 (Math for Elementary and Middle School Teachers): Winter 2018.\*\*

M-Engin (Calculus I): Summer 2017.

*\*Course co-coordinator*

*\*\*Teaching assistant*

*For the semesters without asterisk, instructor of record for a class of 20–30 students.*

### Stony Brook University

Math 312 (Applied Algebra: Modern Algebra with Applications): Spring 2021.

## SERVICE TO UNIVERSITY

Mathematics Department Graduate Recruitment Committee (2023 - 2024)

Mathematics Department Colloquium Committee (2022-2023), co-chair (Spring 2023).

Mathematics Department Development Committee (2022-2023)

College of science scholarship committee (2023)

Thesis committee: José Ignacio Yáñez (2023)

Informal PhD reading course: Daniel Apsley (2022-present)

Postdoc: Quentin Posva (2022-2023); co-mentored with C. Hacon and K. Schwede.

Undergrad intro to research project: Tyler Perkins (Summer 2023), Ashlea Heyen (Fall 2023)

**ORGANIZATION** Co-organizer of the University of Utah Algebraic Geometry Seminar 2019–2020

Co-organized training session for first year grad student instructors 2014

**REFeree  
WORK**

Provided referee reports and/or quick opinions for journals including:

Advances in Mathematics, Algebra and Number Theory, Annals of Mathematics, Canadian Journal of Mathematics, Compositio Mathematica, Duke Mathematics Journal, European Journal of Math, EpiGA, Forum of Math Pi, Journal of Geometric Analysis, Journal of London Mathematics Society, Journal of the American Mathematical Society, International Math Research Notices, Inventiones mathematicae, Mathematics Research Letters, Mathematische Zeitschrift, Proceedings of the American Mathematical Society, Proceedings of London Mathematics Society, Selecta Mathematica, Transactions of the AMS.