Casey Blacker

Contact information

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Research interests

Higher structures in differential geometry, including bundle gerbes, Lie groupoids, multisymplectic manifolds, and moment maps

Employment

2025 –	**Assistant Professor, Augusta University**
2023 – 2025	Postdoctoral Research Fellow, George Mason University
2020 – 2022	EIMI International Postdoc, Saint Petersburg State University
2018 – 2020	CPSF International Exchange Postdoc, East China Normal University

Visiting positions

12/25	Visiting Scientist, Max Planck Institute for Mathematics

Education

2018	PhD, University of California, Santa Barbara *with* Certificate in College and University Teaching *advised by* Xianzhe Dai
2015	MA, University of California, Santa Barbara
2013	Master of Mathematics (Pure Mathematics, Fast-Track), University of St Andrews undergraduate degree, First Class Honours

Papers and preprints

1. Reduction of L_∞-algebras of observables on multisymplectic manifolds (with A. Miti and L. Ryvkin). *SIGMA* 20, 061, 2024
2. Reduction of multisymplectic manifolds. *Lett. Math. Phys.*, 111(3):Paper No. 64, 30, 2021
3. Quantization of polysymplectic manifolds. *J. Geom. Phys.*, 145:103480, 2019
4. Polysymplectic reduction and the moduli space of flat connections. *J. Phys. A*, 52(33):335201, 2019
5. First eigenvalue of the p-Laplacian on Kähler manifolds (with S. Seto). *Proc. Amer. Math. Soc.*, 147(5):2197-2206, 2019
6. *The Moduli Space of Flat Connections over Higher Dimensional Manifolds.* ProQuest LLC, Ann Arbor, MI, 2018. Thesis (Ph.D.)–University of California, Santa Barbara

Conference proceedings

1. Algebraic and geometric reduction of multisymplectic manifolds. *J. Phys. Conf. Ser.* (Contribution to QTS12) 2667 1, 2023

Lecture notes

1. Introduction to Symplectic Geometry
`https://math.gmu.edu/~cblacke/teaching.html`

Invited talks

12/25 *Higher Geometry Seminar*, Max Planck Institute for Mathematics
10/25 *Geometry & Topology Seminar*, University of Waterloo
4/25 *Trans-Carpathian Seminar on Geometry & Physics*
12/24 *Joint Meeting of the NZMS, AustMS and AMS*,
Special Session on Recent Advances in Geometric PDEs, University of Auckland
6/24 *Summer Meeting of the Canadian Mathematical Society*,
Special Session on Symplectic and Poisson Geometry, University of Saskatchewan
11/23 *PIMS Geometry, Algebra and Physics Seminar*, University of Saskatchewan
11/23 *Mathematics Department Colloquium*, University of Manitoba
7/23 *XII. International Symposium on Quantum Theory and Symmetries*, Czech Technical University
12/22 *Seminarium Theory of Duality*, University of Warsaw
4/22 *Weekly Departmental Seminar*, Tbilisi State University
12/21 *Young Scientists' Congress*, Russian Year of Science and Technology, Sochi
7/21 *Singular Foliations and Related Structures*, Virtual Seminar
11/20 *Geometry and Combinatorics Seminar*, Chebyshev Lab, Saint Petersburg
9/20 *Workshop on Multisymplectic Geometry*, KU Leuven
12/19 *Super-Riemann Surfaces and Related Topics*, University of Tokyo
11/19 *Workshop on Differential Geometry*, Tongji University
7/19 *Oberseminar Geometrie, Topologie und Analysis*, University of Cologne
12/18 *Postdoc Seminar*, NYU Shanghai
5/18 *MathConnections 2018*, University of California, Riverside
1/18 *Joint Mathematics Meetings of AMS and MAA*
Special Session on Differential Geometry

Events organized

1/24 Workshop on Multisymplectic Structures in Geometry and Physics
(*with* Antonio Miti *and* Leonid Ryvkin)
`https://math.gmu.edu/~cblacke/lyon.html`

7/21 *Young Researchers'* Virtual Multisymplectic Geometry Conference 2021
`https://math.gmu.edu/~cblacke/yrvmgc_21.html`

7/20 *Young Researchers'* Virtual Multisymplectic Geometry Conference 2020
`https://math.gmu.edu/~cblacke/yrvmgc_20.html`

Seminars organized

5/24 – 6/24	String Theory Learning Seminar* `https://math.gmu.edu/~cblacke/strings.html`
9/21 – 1/22	SPbU Young Researchers' Seminar `https://indico.eimi.ru/category/57/`
4–6/21	Generalized Complex Geometry Learning Seminar `https://math.gmu.edu/~cblacke/seminar.html`
10–11/20	Virtual Postdoc Seminar
3–6/17	Classical Mechanics Learning Seminar* *Lectures on Mechanics,* by J. Marsden
1/17	Graduate Geometry Seminar* *A Mathematical Introduction to Conformal Field Theory,* by M. Schottenloher
8–12/15	Graduate Geometry Seminar* *Methods of Classical Mechanics,* by V.I. Arnold
10–12/14	Graduate Geometry Seminar *Characteristic Classes,* by J. Milnor and J. Stasheff

* with participation from the Physics Department

Service

—	Reviewer for • *Journal of Mathematical Physics* • *SIGMA* • *Geometric Mechanics* • *Journal of Nonlinear Science* • *Springer INdAM Series* • *Journal of Symplectic Geometry* • *Mathematical Reviews* • National Sciences and Engineering Research Council of Canada
5/25	Judge for GMU College of Science Undergraduate Research Colloquium
5/24	Judge for GMU College of Science Undergraduate Research Colloquium
4/24	Proctor and grader for GMU Math Dept. Calculus Olympiad

I am currently serving on the following Math Department committees at Augusta University:

- *Core Math Committee:* Responsible for overseeing lower-division service courses, including producing a standardized final exam.
- *Math Contest Committee:* Tasked with coordinating a regional high school math competition held each spring.

Mentored publications

1.	Logarithmic spirals on surfaces of constant Gaussian curvature (with P. Tsyganenko), *Involve* 17-4, 689–708, 2024

Mentorship

8/24 – 6/24	Honors thesis Advising the undergraduate honors thesis of Nicholas Lear on *Stacks over Topological Spaces*. Starting with a background in elementary topology and category theory, the project aims to understand sheaves, fiber bundles, fibered categories, prestacks, and stacks, with an emphasis on concrete examples.
8/24 – 12/24	Program for Advanced Teaching of Mathematics PAT Math is the GMU Math Department's program for introducing graduate students to teaching. Mentors meet every few weeks with their mentees to discuss all aspects of teaching and additionally host mentees as observors in a couple of their undergraduate lectures. I was the PAT Math mentor of PhD student Michael Merkle for Fall Semester 2024.
7/24 –	Graduate research project Leading PhD students Ethan Clelland and Michael Merkle in a research project on *A Lie* 2*-functor for coherent* 2*-groups*. We to develop proficiency in (co)differential (co)algebras, Lie groupoids and Lie algebroids, L_∞-algebras, monoidal categories and 2-categories, and associated topics. We also discuss effective mathematical communication and project management skills.
1/24 – 6/24	Mason Experimental Geometry Lab Supervising a team of three undergraduate students (Nicholas Lear, Anthony Vu, and Morgan Shuman) and two graduate mentors (Ethan Clelland and Michael Merkle) in a project on *Finite* 2*-groups*. This involved weekly all-team meetings as well as three weekly one-on-one meetings between each undergraduate and each mentor on a rotating basis. The project culminated with a final report, a presentation at the MEGL colloquium, and a poster at the College of Science Undergraduate Research Colloquium.
9/21 – 2/22	Saint Petersburg Public High School No. 564 After teaching an evening course based on *Differential Geometry of Curves and Surfaces*, by M. do Carmo, I supervised two student research projects, on 1. *Generalized loxodromes on surfaces of constant Gaussian curvature*, Pavel Tsyganenko 2. *Geodesics on surfaces of revolution with convex profile curve*, Alexander Travin Each project was presented at the Baltiyskiy Science Fair (`https://baltkonkurs.ru`).

Honors and awards

9/18 – 9/20	China Postdoctoral Science Foundation (CPSF) International Exchange Fellowship
11/14	Academic Senate Outstanding Teaching Assistant Award Nominee
9/13 – 9/17	NSF PhD Fellowship with Research Training Group in Geometry–Topology

Academic visits

1/24	Université Claude Bernard Lyon 1, *host:* Leonid Ryvkin
11/23	University of Saskatchewan, *host:* Steven Rayan
	University of Manitoba, *host:* Derek Krepski
11/22	Gebze Technical University, Istanbul, *host:* Oğul Esen
4/22	Ilia State University, Tbilisi, *host:* Giorgi Khimshiashvili
7/19	University of Cologne, *host:* George Marinescu

Pedagogical training

2018	Certificate in College and University Teaching, UCSB (`https://www.graddiv.ucsb.edu/policy-procedure/certificate-in-teaching`) A multi-year program offered by the UCSB Department of Instructional Development to train aspiring faculty in research-based best-practices in teaching, course structure and development, inclusivity and accessibility, and assessment.

I have completed the following workshops through the Augusta Universtiy Center for Instructional Innovation:

11/25	A New Hope: Academic Integrity in the Age of AI
	From Clicks to Clarity: Leveraging Rubrics and Data for Student Success
9/25	The Neuroscience and Cognitive Biology of Learning
	Boosting Productivity with Generative Tools
8/25	InterActive Lecturing
	Teaching with Generative AI

Teaching

2025	Precalculus
	Elementary Statistics
	College Algebra
	Advanced Linear Algebra
	Introduction to Advanced Mathematics
24	Functions of a Complex Variable
	Analytic Geometry and Calculus III
	Geometry
23	Probability
21	Symplectic Geometry*
20	Symplectic Geometry*
18	Multivariable Calculus II
17	Multivariable Calculus I
16	Differential Equations
15	Calculus for the Social and Life Sciences

* indicates a graduate course

Teaching assistantships

2018	Multivariable Calculus II
	Multivariable Calculus II
17	Introduction to Higher Mathematics
16	Calculus I
15	Linear Algebra
14	Introduction to Higher Mathematics
13	Calculus for the Social and Life Sciences