



Juliette Bruce
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Department of Mathematics
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Dear Committee Members,

I am writing to apply for the tenure-track assistant professorship in Computer Science and Mathematics at Whittier College. Currently, I am a postdoctoral researcher in the Mathematics Department at Brown University, a position I have held since August 2022. I received my Ph.D. in Mathematics from the University of Wisconsin-Madison under the guidance of my advisor Professor Daniel Erman in 2020. From 2020-2022 I was an NSF Postdoctoral Fellow in the Mathematics Department at the University of California, Berkeley. Additionally, I was a postdoctoral fellow at the Mathematical Sciences Research Institute for the 2020-2021 academic year.

I am especially interested in this position given Whittier College's commitment to providing an excellent liberal arts education to a diverse student body (including many first-generation students). I feel like this position is well matched to my goals of working to support students from wide-range of backgrounds, making the mathematics community more inclusive for people from underrepresented groups, and establishing a thriving research program that significantly incorporates undergraduate research. I would be extremely excited to work with such amazing students from diverse backgrounds both in and out of the classroom and on research experiences. For example, would love to organize initiatives and programs aimed at supporting LGBTQ+ students, students of color, and women in mathematics. Longer term I would love to organize an REU program, similar to MSRI-UP, which promotes and supports LGBTQ+ students exploring mathematics research and pursuing graduate school.

Further, Whittier College's First Year Seminars sound like an amazing resource for the students and an opportunity. I would love to take part in it, and I have a number of ideas for courses that I would love to teach: a course on non-linear/applied algebra, or a course exploring the ways mathematics and gender and sexuality have historically intersected, a course on the ways computation and data science can be used in algebra and geometry. I am passionate about teaching and working with students, and I continually strive to grow as an educator, always trying to center the needs of students. In particular, I would be excited to help develop curriculum that centers the lives, experiences, and needs of underrepresented students.

My research interests lie in the intersection of algebraic geometry and commutative algebra with connections to combinatorics and number theory. I am interested in using homological, combinatorial, and computational methods to study the geometry of algebraic varieties. Currently, my research program has two broad directions.

- (i) I have sought to deepen and expand our understanding of the ways homological algebra can be used to study the geometry of toric varieties. This seeks to generalize a very classical story using homological algebra to understand subvarieties of projective space.
- (ii) I have been studying the geometry and topology of various moduli spaces, e.g., the moduli



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space of (principally polarized) abelian varieties of a fixed dimension, via combinatorially and homological methods. This has led to novel applications to the cohomology of certain arithmetic groups.

Further, I am passionate about promoting inclusivity, diversity, and justice in the mathematics community. This passion extends throughout my teaching where I am dedicated to creating an interactive and supportive classroom environment that helps students thrive.

Much of my work carries a significant computational component. I have co-authored four published software packages, and multiple publications that revolve around using high-throughput high-performance computing to explore new mathematical phenomena. Computation is a driving component of my research and teaching, and I would love the opportunity to share my views on computation, mathematics, and science with my colleagues and students.

My research output includes 15 papers, with publications in journals such as *Algebra & Number Theory*, *Geometry & Topology*, and *Experimental Mathematics*, as well as, multiple published software packages. Below are a few of the non-research highlights of my file.

- I was awarded an *NSF Postdoctoral Research Fellowship*, an *NSF Graduate Research Fellowship*, and I have secured over \$100,000 in conference grants, including 4 NSF conference grants.
- I served on the Software Presentation Committee for the International Symposium for Symbolic and Computational Algebra.
- I was awarded the highest departmental and campus-wide teaching awards at the University of Wisconsin-Madison, the Capstone Teaching Award (2019), and the Teaching Assistant Award for Exceptional Service (2018), awarded to 1 and 3 students each year respectively.
- I organized two summer undergraduate research programs, and participated in one summer research program for students starting graduate school. One of the undergraduates I mentored was awarded an *NSF Graduate Research Fellowship* to student mathematics.

With my application, I include a cover letter, a curriculum vitae, a research statement, a teaching statement, sample teaching evaluations, an unofficial graduate transcript, and a diversity statement. I will have five letters of recommendation. four research letters: Christine Berkesch (cberkesch@umn.edu), Melody Chan (melody_chan@brown.edu), Daniel Erman (erman@hawaii.edu), and Gregory G. Smith (ggsmith@mast.queensu.ca), and one teaching letter from Shirin Malekpour (shirin.malekpour@wisc.edu).

Please do not hesitate to contact me if there is anything else I can provide, or with any questions, and thank you in advance for your consideration.

Sincerely,

Juliette E. Bruce

Juliette Bruce
Postdoctoral Research Associate