Juliette Bruce's Project Summary

Overview The PI proposes to study questions in commutative algebra, algebraic geometry, and arithmetic geometry. On project proposal seeks to study homological questions in commutative algebra and algebraic geometry from an asymptotic prospect, and involves interplay with high performance computing and numerical linear algebra.

Intellectual Merit. The PI's first project seeks to expand our understanding of syzygies of algebraic varieties by

Broader Impacts. As a LGBTQ women the PI has worked hard to promote diversity, inclusivity, and justice in the mathematical community. This proposal will further the PI's work in this direction by her continued involvement in as a mentor to multiple undergraduate women via the Association for Women in Mathematics's mentor network. The PI would also plans to try to mentor undergraduates via the Berkeley Directed Reading Program and the MSRI-Up program.

The PI has organized a number of conferences including the *Graduate Workshop in Commutative Algebra for Women and Mathematicians of Minority Genders* (2019), a workshop brining together algebraic geometers and number theorists *Geometry & Arithmetic of Surfaces* (2019), and a five day conference dedicated to developing open source computer software for algebraic geometry and commutative algebra *M2@UW* (2018). Going forward the PI plans to organize a follow-up to *Graduate Workshop in Commutative Algebra for Women and Mathematicians of Minority Genders* tentatively planned for Spring 2021, as well as, a conference for LGBTQ+ mathematicians in algebraic geometry and commutative algebra.