SCREMS: The Frontiers of Representation Theory, Number Theory, and Mathematical Physics

This proposal would support research by three related groups of researchers into the frontiers of Representation Theory, Number Theory, and Mathematical Physics.

The Representation Theory group will compute the Kazhdan–Lusztig–Vogan polynomials for all simple Lie groups up to rank 9 and make the results of these computations readily available to researchers worldwide. This group will also continue to explore the combinatorial infrastructure of W-graphs and relate it to representation theoretical invariants.

The Number Theory group will carry out major computations of modular forms and L-functions, and greatly enhance our understanding of the Birch and Swinnerton-Dyer conjecture and the Riemann Hypothesis, two of the central problems in number theory.

The Mathematical Physics group will complete the first major step in the classification of off-shell representations of Supersymmetry, a problem that has been open for three decades.

All three groups have worked very productively together during the last two years, and if funded this proposal will likely lead to many similar future collaborations.

Intellectual Merit:

Each of these three projects will advance the state of the art in applications of computation to research mathematics, and lead to new tools and data to support work in representation theory, number theory, and mathematical physics.

Broader Impact:

All data and software that comes out of this project will be made freely available over the Internet. This will result in tools that will transform how researchers in mathematics share and manipulate their data and collaborate. Much of the data that arises out of these projects will also be of great value to many mathematicians.