

## **Final Report**

### **MSRI Workshop: Flavors of Groups**

November 18-22, 2005 at the Banff International Research Station

**Organizing Committee:** Mladen Bestvina, Jeff Brock, Jon Carlson, Persi Diaconis, Hugo Rossi

This workshop brought together researchers working on algebraic, analytic, combinatoric, geometric and topological aspects of group theory in order to exchange techniques and ideas in preparation for the full year emphasis at MSRI in the academic year 2007-2008 on all these aspects of groups. The four particular topics present (representing the four individual semester programs at MSRI) were:

**Geometric Group Theory.** This is a relatively young field, with older and deeper roots in the study of groups from combinatorial and topological perspectives. In the mid 1980's, spurred by ideas of Cannon and Gromov, group theorists began to pay attention to the geometric structures which cell complexes can carry. This attention shed light on the earlier combinatorial and topological investigations, and stimulated innovative ideas which have been developing at a rapid pace: Gromov hyperbolicity, Bestvina-Brady Morse theory, splittings and actions on trees, rapid decay and the Baum-Connes conjecture.

**Kleinian Groups.** The study and application of recent advances in the classification of hyperbolic 3-manifolds (the solution of the tameness and ending lamination conjectures of Marden and Thurston) can lead to a better understanding of the geometry of closed hyperbolic 3-manifolds. This work also touches on Teichmüller theory, and questions concerning billiards and flows on Moduli space. Many of these avenues are potentially very fruitful for further research and synthesis between, up to now, largely disparate fields.

**Combinatorial Representation Theory.** There is a productive interplay between combinatorics, geometry, finite groups, Lie theory and hyperplane arrangements in the applications to representation theory. Examples are: (1) the use of symmetric functions and Hecke algebras in the modular representation theory of finite groups of Lie type, (2) the use of braid groups and finite dimensional algebras in the study of categories of highest weight modules and (3) the use of tableaux, crystals, and the path model in the study of representations of algebras with triangular decomposition.

**Representation Theory of Finite Groups.** Current research centers on many open questions, particularly regarding representations over the integers or rings of positive characteristic. Brauer developed block theory to better understand such representations, and in the last few years there have been many exciting new conjectures concerning correspondence of characters and derived equivalences of blocks. Topics such as  $p$ -local groups, group actions on finite complexes and homotopy representations blend algebra and topology in novel and productive ways.

With four talks a day there was plenty of time for informal discussion and interaction among the various areas of interest. On Sunday evening there was a meeting of the MSRI program organizers, initiating integrated planning for the MSRI intensive year. In all, there were 32 participants, of whom 7 were women. The participants (speakers are asterisked), with their affiliations were:

Barcelo, Helene, Arizona State University	*Benson, David, University of Georgia
Brock, Jeffrey, Brown University	*Bromberg, Ken, University of Utah
Canary, Richard, University of Michigan	Cannon, Jim , Brigham Young University
Carlson, Jon, University of Georgia	Charney, Ruth, Brandeis University
*Diaconis, Persi, Stanford University	*Erdmann, Karin, Oxford University
*Grodal, Jesper, University of Chicago	*Hamenstaedt, Ursula, University of Bonn
*Kamnitzer, Joel, MIT	*Kerckhoff, Steven, Stanford University
*Kleshchev, Alexander, Univ of Oregon	*Malle, Gunter, Univ of Vienna
*Masur, Howard, Univ Illinois, Chicago	*McCammond, Jon , UC Santa Barbara
*Mosher, Lee, Rutgers University	Pettet, Alexandra, Univ of Chicago
Postnikov, Alex , MIT	Reid, Alan, UT Austin
Rickard, Jeremy, Univ of Bristol	Robinson, Geoffrey, Univ of Aberdeen
Rossi, Hugo, MSRI	Sapir, Mark, Vanderbilt University
*Souto, Juan, University of Chicago	*Thiem, Nat, Stanford University
*Valette, Alain, University of Neuchatel	Vinroot, C. Ryan, Univ of Arizona
*Vogtmann, Karen, Cornell University	*Williams, Lauren, UC Berkeley