Abstract. The overall theme of the conference was geometric group theory, interpreted quite broadly. In general, geometric group theory seeks to understand algebraic properties of groups by studying their actions on spaces with various topological and geometric properties; in particular these spaces must have enough structure-preserving symmetry to admit interesting group actions. Although traditionally geometric group theorists have focused on finitely generated (and even finitely presented) countable discrete groups, the techniques that have been developed are now applied to more general groups, such as Lie groups and Kac-Moody groups, and although metric properties of the spaces have played a key role in geometric group theory, other structure such as complex or projective structures and measure-theoretic structures are being used more and more frequently.

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Introduction by the Organisers

In addition to discussing the most recent developments within geometric group theory, the meeting also highlighted several dramatic contributions of geometric group theory to other fields. A particular emphasis within the field was studying several classes of groups which exhibit properties of classical examples such as arithmetic groups but are not themselves arithmetic.

The idea that a group can be thought of as a geometric object with non-positive or negative curvature is one of the most fundamental ideas in geometric group theory. Curvature conditions have helped us to understand both the general, randomly defined group and specific families of groups arising from topological of
differential-geometric considerations. The focus has recently shifted to variants on these curvature conditions, both those which were defined long ago but not intensively studied and newly introduced notions. For example, Gromov introduced “relative hyperbolicity” at the same time as he defined hyperbolicity, but this was not studied deeply until at least a decade later. Relative hyperbolicity captures behavior similar to that of non-uniform lattices in real hyperbolic spaces in a more general, non-smooth framework. Other variants of hyperbolicity focus on properties of a particular group action rather than the group itself, and generalize classical small cancellation theory. This has led to the construction of quotient groups with prescribed properties, starting from a suitable action of a group on a space, and has had applications to groups arising from unexpected quarters, such as proving that the Cremona group is not simple.

Several talks during the week dealt with new techniques and questions. For example, in some talks the use of an auxiliary space with a group action is less central, such as in investigating the possible growth rates of finitely generated groups, or in attempts to establish a general theory of totally disconnected locally compact groups. In others, the structures on spaces preserved by the group action are more of an analytic nature than a geometric one, for example there are some exciting connections with measure theory and with operator algebras, some of which lead to deep topological questions.

Specific families of groups that were considered in the talks included mapping class groups $\text{MCG}(\Sigma)$ of surfaces, groups of outer automorphisms $\text{Out}(F_n)$ of non-abelian free groups and isometry groups of buildings. These are of particular interest because of their connections with many other areas of mathematics, and because each in its way generalizes the classical examples of linear groups acting on symmetric spaces. The construction of suitable substitutes for the symmetric spaces and the investigation of even the most basic properties are often very difficult.

Certainly one of the most exciting developments in the field was the recent use of geometric group theory to solve the last open conjecture on W. Thurston’s famous list of problems on the structure of 3-manifolds. Two speakers gave talks explaining both the geometric group theory and its application to 3-manifolds during the official schedule, and informal sessions were held in the evenings for those who wanted to hear more details. Progress is currently being made on simplifying some of the proofs, and there are many further potential applications of the technology to geometric group theory.

We had 52 participants from a wide range of countries, and 26 official lectures. The staff in Oberwolfach was—as always—extremely supportive and helpful.

We are very grateful for the additional funding for 5 young PhD students and recent postdocs through Oberwolfach-Leibniz-Fellowships. In addition, there was one young student funded through the DMV Student’s Conference. We think that this provided a great opportunity for these students.

We feel that the meeting was exciting and highly successful. The quality of all lectures was outstanding, and outside of lectures there was a constant buzz
of intense mathematical conversations. We are confident that this conference will lead to both new and exciting mathematical results and to new collaborations.
## Workshop: Geometric Structures in Group Theory

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