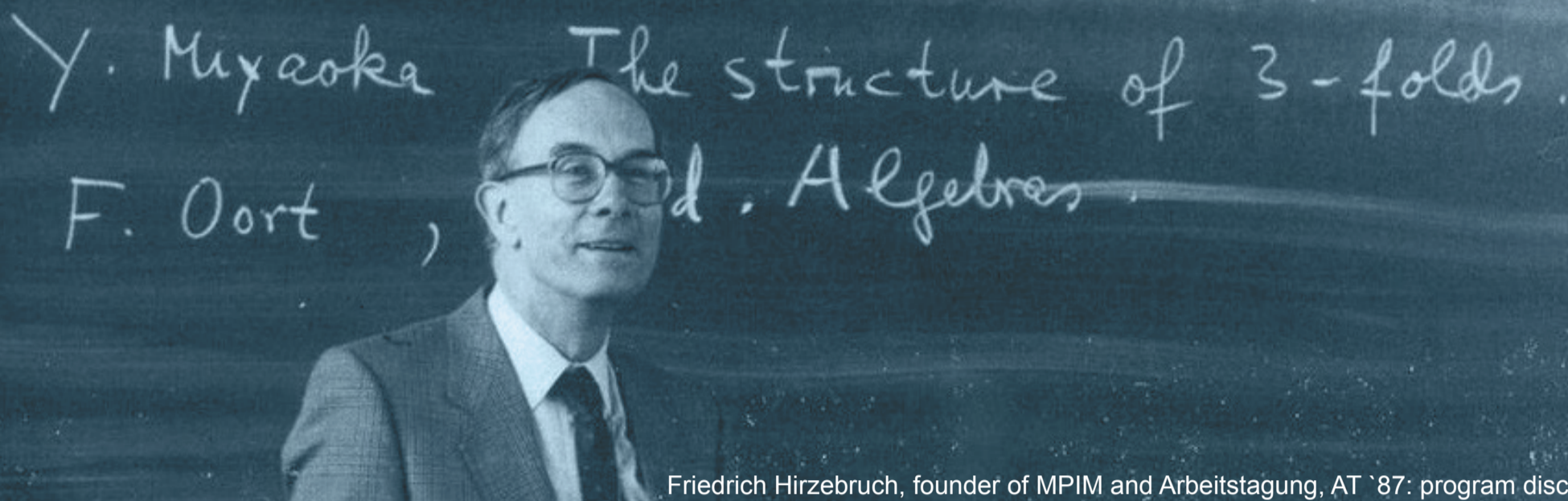
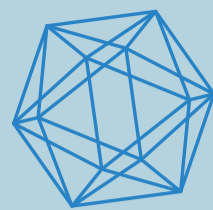


Arbeitstagung on Geometry

MAX PLANCK INSTITUTE
FOR MATHEMATICS
BONN



Friedrich Hirzebruch, founder of MPIM and Arbeitstagung, AT '87: program discussion

July 8 - 12, 2019

Organizers: W. Ballmann, U. Hamenstädt, and M. Kapovich

Local organizers: W. Ballmann and C. Blohmann

Invited speakers

de Cornulier, Yves (Université Lyon 1)

Di Nezza, Eleonora (Sorbonne Université)

Fisher, David (Indiana University - Bloomington)

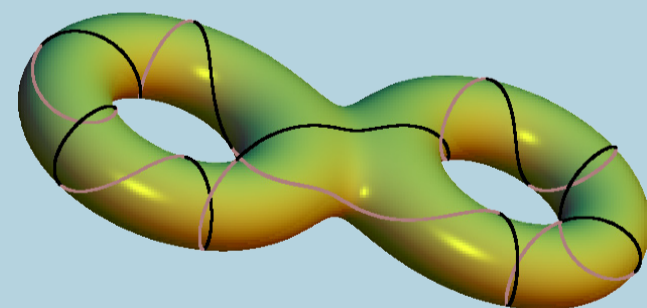
Gelander, Tsachik (Weizmann Institute)

Hein, Hans-Joachim (Fordham University)

Kleiner, Bruce (New York University)

Markovic, Vladimir (Caltech)

Song, Antoine (Princeton University)



A geodesic on a surface of genus two.

Minicourses by

Gelander, Tsachik (Weizmann Institute)

Kleiner, Bruce (New York University)

In addition to the scheduled talks, 6 more lectures will be determined in the traditional Arbeitstagung way by open discussion during the meeting.

This event is a cooperation with the Hausdorff Center for Mathematics in Bonn.
For further information and registration see www.mpim-bonn.mpg.de/AT2019
Contact: AT2019@mpim-bonn.mpg.de

Program of the Arbeitstagung 2019 on Geometry

Mon, 08 Jul 2019

- 08:30 - 09:30 *Registration*
- 09:30 - 10:30 MPIM Lecture Hall
BRUCE KLEINER (NEW YORK UNIVERSITY)
Diffeomorphism groups, moduli spaces, and Ricci flow. Part 1
- 10:30 - 11:00 *Coffee break*
- 11:00 - 12:00 MPIM Lecture Hall
ELEONORA DI NEZZA (LA SORBONNE UNIVERSITÉ, INSTITUT DE
MATHÉMATIQUES DE JUSSIEU)
Log-concavity of volume
- 12:00 - 12:30 MPIM Lecture Hall
Program discussion
- 15:00 - 16:00 MPIM Lecture Hall
YVES DE CORNULIER (CNRS AND INSTITUT CAMILLE JORDAN, UNIVERSITÉ
LYON 1)
On systolic growth of Lie groups
- 16:00 - 16:30 *Tea break*

Tue, 09 Jul 2019

- 09:30 - 10:30 MPIM Lecture Hall
BRUCE KLEINER (NEW YORK UNIVERSITY)
Diffeomorphism groups, moduli spaces, and Ricci flow. Part 2
- 10:30 - 11:00 *Coffee break*
- 11:00 - 12:00 MPIM Lecture Hall
ANTOINE SONG (PRINCETON UNIVERSITY)
Existence of infinitely many minimal hypersurfaces in closed manifolds
- 12:00 - 12:30 MPIM Lecture Hall
Program discussion
- 15:00 - 16:00 LUCA DI CERBO (UNIVERSITY OF FLORIDA)
Complex hyperbolic surfaces with cusps
- 16:00 - 16:30 *Tea break*
- 16:30 - 17:30 BEATRICE POZZETTI (HEIDELBERG)
Compactifications of Hitchin and maximal character varieties
- 19:00 - 22:00 *Rector's reception*

Wed, 10 Jul 2019

- 09:30 - 10:30
MPIM Lecture Hall
BRUCE KLEINER (NEW YORK UNIVERSITY)
Diffeomorphism groups, moduli spaces, and Ricci flow. Part 3
- 10:30 - 11:00
Coffee break
- 11:00 - 12:00
MPIM Lecture Hall
TSACHIK GELANDER (WEIZMANN INSTITUTE OF SCIENCE, REHOVOT)
On the topology of nonpositively curved manifolds. Part 1
- 12:00 - 13:00
DON ZAGIER (MPIM)
Two results connected with the Riemann hypothesis

Thu, 11 Jul 2019

- 09:30 - 10:30
MPIM Lecture Hall
TSACHIK GELANDER (WEIZMANN INSTITUTE OF SCIENCE, REHOVOT)
On the topology of nonpositively curved manifolds. Part 2
- 10:30 - 11:00
Coffee break
- 11:00 - 12:00
SHI WANG (INDIANA UNIVERSITY BLOOMINGTON)
Simplicial volume of nonpositively curved manifolds
- 15:00 - 16:00
ALINA VDOVINA (NEWCASTLE)
Ramanujan complexes and nonresidually finite $CAT(0)$ groups
- 16:00 - 16:30
Tea break
- 16:30 - 17:30
GABRIELE VIAGGI (UNIVERSITY OF BONN)
Volumes of random hyperbolic 3-manifolds

Fri, 12 Jul 2019

- 09:30 - 10:30
MPIM Lecture Hall
TSACHIK GELANDER (WEIZMANN INSTITUTE OF SCIENCE, REHOVOT)
On the topology of nonpositively curved manifolds. Part 3
- 10:30 - 11:00
Coffee break
- 11:00 - 12:00
MPIM Lecture Hall
DAVID FISHER (INDIANA UNIVERSITY, BLOOMINGTON)
Arithmeticity, superrigidity and totally geodesic submanifolds

Arbeitstagung 2019 on Geometry

Titles and abstracts of talks

BRUCE KLEINER

Diffeomorphism groups, moduli spaces, and Ricci flow. Part 1

The lecture will explain some new applications of Ricci flow to long-standing conjectures concerning the topology of diffeomorphism groups and moduli spaces of Riemannian metrics.

ELEONORA DI NEZZA

Log-concavity of volume

In this talk we present a proof of the log-concavity property of total masses of positive currents on a given compact Kähler manifold, that was conjectured by Boucksom, Eyssidieux, Guedj and Zeriahi. The proof relies on the resolution of complex Monge-Ampère equations with prescribed singularities. As corollary we give an alternative proof of the Brunn-Minkowski inequality for convex bodies. This is based on a joint work with Tamas Darvas and Chinh Lu.

Program discussion

YVES DE CORNULIER

On systolic growth of Lie groups

Introduced by Gromov in the nineties, the systolic growth of a finitely generated group maps n to the smallest index of a finite index subgroup meeting the n -ball only in the identity singleton. This function is one measure of residual finiteness. It extends to compactly generated locally compact groups, replacing "finite index" with "cocompact lattice" in the definition. It grows as least as fast as the word growth, and with Bou-Rabee we showed that the growth is exponential for linear groups of exponential growth. For finitely generated groups with polynomial growth, the systolic growth is also polynomially bounded, but possibly with worse exponent. For a lattice Γ in a simply connected nilpotent Lie group G , we show the following: Γ has systolic growth asymptotically equivalent to the word growth if and only if the same holds for G , if and only if the Lie algebra of G admits a Carnot grading. In some non-Carnot cases, we provide an estimate of the systolic growth; for instance in one case it grows as n^k for some non-integer k .

BRUCE KLEINER

Diffeomorphism groups, moduli spaces, and Ricci flow. Part 2

The lecture will explain some new applications of Ricci flow to long-standing conjectures concerning the topology of diffeomorphism groups and moduli spaces of Riemannian metrics.

ANTOINE SONG

Existence of infinitely many minimal hypersurfaces in closed manifolds

In the early 80's, Yau conjectured that in any closed 3-manifold there should be infinitely many closed minimal surfaces. I will survey previous results related to the question and present a proof of the conjecture. It builds on the min-max theory of F. Almgren and J. Pitts, which has recently been further developed by F. C. Marques and A. Neves.

Program discussion

LUCA DI CERBO

Complex hyperbolic surfaces with cusps

Tea break

BEATRICE POZZETTI

Compactifications of Hitchin and maximal character varieties

BRUCE KLEINER

Diffeomorphism groups, moduli spaces, and Ricci flow. Part 3

The lecture will explain some new applications of Ricci flow to long-standing conjectures concerning the topology of diffeomorphism groups and moduli spaces of Riemannian metrics.

TSACHIK GELANDER

On the topology of nonpositively curved manifolds. Part 1

The volume of a manifold controls its topological complexity. This is best illustrated by the Gauss-Bonnet theorem in dimension 2. Another classical result in that spirit is Gromov's theorem concerning the Betti numbers in higher dimensions. There are many other results supporting this doctrine, especially when focusing on special sub-classes, such as locally symmetric or arithmetic manifolds. In some cases one obtains stronger results for manifolds of large volume. In the mini-course I will try to explain what is known and what is expected but still unknown as well as some of the main techniques that are involved, coming from group theory, topology, geometry, number theory and rigidity.

DON ZAGIER

Two results connected with the Riemann hypothesis

TSACHIK GELANDER

On the topology of nonpositively curved manifolds. Part 2

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SHI WANG

Simplicial volume of nonpositively curved manifolds

ALINA VDOVINA

Ramanujan complexes and nonresidually finite CAT(0) groups

GABRIELE VIAGGI

Volumes of random hyperbolic 3-manifolds

TSACHIK GELANDER

On the topology of nonpositively curved manifolds. Part 3

The volume of a manifold controls its topological complexity. This is best illustrated by the Gauss-Bonnet theorem in dimension 2. Another classical result in that spirit is Gromov's theorem concerning the Betti numbers in higher dimensions. There are many other results supporting this doctrine, especially when focusing on special sub-classes, such as locally symmetric or arithmetic manifolds. In some cases one obtains stronger results for manifolds of large volume. In the mini-course I will try to explain what is known and what is expected but still unknown as well as some of the main techniques that are involved, coming from group theory, topology, geometry, number theory and rigidity.

DAVID FISHER

Arithmeticity, superrigidity and totally geodesic submanifolds

I will discuss a recent result on finite volume hyperbolic manifolds of dimension at least 3. We show that any such manifold with infinitely many maximal closed totally geodesic submanifolds has arithmetic fundamental group. A closed totally geodesic manifold is maximal if it is not contained in another closed proper totally geodesic submanifold. So in particular a closed totally geodesic submanifold of codimension one is always maximal. This answers a question of Reid and McMullen. The proof deduces arithmeticity from a superrigidity theorem and makes key use of equidistribution results from homogeneous dynamics. If time permits, I will also discuss some other applications of our techniques and some related open questions. This is joint work with Uri Bader, Nick Miller and Matthew Stover.