

MINI-COURS

« LA TOPOLOGIE DES VARIÉTÉS DE DIMENSION 3 »
6–17 MAI, 2013

“THE TOPOLOGY OF 3-DIMENSIONAL MANIFOLDS”
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Three-manifold groups

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- Lecture 1 : *The geometrization theorem*

We'll discuss the geometric classification of compact 3-manifolds with some examples, taking the proof via Ricci flow (by Perelman et al) as a black box. Then we'll discuss consequences for 3-manifolds and their fundamental groups, including the Borel conjecture, the classification of universal covers of closed 3-manifolds, residual finiteness, the solution of the homeomorphism problem, and the recognition of 3-manifold groups. We'll also describe some examples of residually 3-manifold groups.

- Lecture 2 : *Tameness and Kleinian groups*

We'll discuss some aspects of the classification of Kleinian groups. We'll describe the ends of hyperbolic 3-manifolds, and Canary's covering theorem. We'll define subgroup separability, and explain subgroup separability for geometrically infinite subgroups after Thurston.

- Lecture 3 : *Virtual fibering*

We'll discuss the Thurston norm on homology and sutured manifolds. We'll describe the “guts” of a sutured manifold, and its application to characterizing the faces of the unit ball of the Thurston norm. We'll introduce Residually Finite Rational Solvable (RFRS) groups, and show that irreducible 3-manifolds with RFRS fundamental group are virtually fibered. We'll show that Right-Angled Artin Groups (RAAGs) are RFRS, and therefore virtually special 3-manifolds are virtually fibered, and describe the classification of virtually special 3-manifolds. We'll mention the computation of the rank gradient of 3-manifolds.

- Lecture 4 : *Cubulations*

We'll mention the theorem of Kahn–Markovic that closed hyperbolic 3-manifolds contain nearly geodesic immersed surfaces, and the corollary by Bergeron–Wise that hyperbolic 3-manifold groups are cubulated. We'll describe Wise's results in the cusped and Haken case. We'll introduce hyperbolic groups, and describe Wise's conjecture that cubulated hyperbolic groups are virtually special. Then we'll describe some of the components of the proof of Wise's conjecture.

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