Abstracts for the talks

Ian Agol (University of Illinois at Chicago)

Virtually fibering 3-orbifolds and virtually depth one taut sutured manifolds

We discuss some examples of 3-orbifolds which virtually fiber over S^1, and we give a criterion on the fundamental group of a 3-manifold which implies that it virtually fibers, called residually Q-solvable. We conjecture that a taut sutured manifold admits a depth one taut foliation in a finite sheeted cover. We prove this also in the case that the fundamental group is residually Q-solvable, and as a corollary that taut sutured compression bodies satisfy this conjecture.

Michel Boileau (Toulouse)

Tits alternative and PD(3) groups

We will discuss the existence of non-abelian free groups in PD(3) groups. We will show in particular that a coherent PD(3) group of rank at least 4 always contains a non-abelian free group. This is a joint work with Steve Boyer.

Steve Boyer (Université du Québec à Montréal)

On families of virtually fibred Montesinos link exteriors

William Thurston conjectured over twenty years ago that every compact hyperbolic 3-manifold whose boundary is a possibly empty union of tori is *virtually fibred*, that is, has a finite cover which fibres over the circle. If true, it provides a significant amount of global information about the topology of such manifolds. To date, there has been little evidence to support the conjecture. For instance, there is only one published non-trivial example of a closed virtually fibred hyperbolic rational homology 3-sphere. (*Non-trivial* in this context means that the manifold neither fibres nor semi-fibres.) In this talk I will report on joint work with Xingru Zhang which shows that the conjecture holds for the exteriors of many Montesinos links. As a consequence, we construct an infinite family of closed virtually fibred hyperbolic rational homology 3-spheres. Another byproduct of the construction is that we are able to verify that the fundamental groups of the exteriors of many Montesinos links have a finite index bi-orderable subgroup.

Alex Coward (Oxford)

Detecting the bridge number of hyperbolic knots

Shelly Harvey (Rice)

Homology and Derived p-Series of Groups

Recall that the derived p-series of a group is defined as the the fastest descending normal series whose successive quotients are $\mathbf{Z}_p$-vector spaces. Recently, Lackenby has shown that if the derived p-series of f.p. group has linear growth in mod p homology then it is large. Moreover, various other authors have related the ranks of the successive quotients of the lower central p-series and of the derived p-series of the fundamental group of a 3-manifold M to the volume of M, to whether certain subgroups of the fundamental group of M are free and to whether finite covers of M are "large" in various other senses. We will prove that groups that are mod-p-homology equivalent are isomorphic modulo any term of their derived

p-series, in precise analogy to Stallings' 1963 result for the lower-central p-series. Specifically, let A be a finitely-generated group and B be a finitely presented group. If a homomorphism induces an isomorphism (respectively monomorphism) on $H_1(-;\mathbf{Z}_p)$ and an epimorphism on $H_2(-;\mathbf{Z}_p)$, then for each finite n, it induces an isomorphism (respectively monomorphism) between the quotients of A and B by the n-th terms of their respective p-derived series. More generally, we prove a stronger version that is analogous to Dwyer's extension of Stallings' theorem. This is joint work with Tim Cochran.

Steve Kerckhoff (Stanford)

Reflective Dehn filling in dimension 4

Darren Long (UC Santa Barbara)

The virtual Betti numbers of closed arithmetic 3-manifolds

Joseph Maher (Oklahoma)

Random walks and the complex of curves

Mapping class groups are non-amenable, so the nearest neighbour random walk on the Cayley graph has a linear rate of escape. We show that such a random walk also makes linear progress in the complex of curves.

Sylvain Maillot (Strasbourg)

Sequences of metrics given by Ricci flow on aspherical 3-manifolds

(Joint with L. Bessières, G. Besson, M. Boileau, J. Porti)

We give a sufficient condition for a closed, orientable, aspherical 3-manifold to contain an incompressible torus or be Seifert fibered. This result gives an alternative argument for the last step of Perelman's proof of the Geometrization Conjecture in the aspherical case.

In this talk I will give a broad outline of the proof and explain the applications to geometrization. A more detailed discussion will be given in J. Porti's talk.

Joan Porti (Barcelona)

More on sequences of metrics on aspherical manifolds

This is joint work with L. Bessières, G. Besson, M. Boileau and S. Maillot. We propose an approach of the final step of geometrization that relies on Thurston's hyperbolization of Haken manifolds and avoids fibration theorems for Alexandrov spaces. Thus we analyze sequences of metrics of aspherical manifolds coming from the long term Ricci flow. This talk will precise some aspects of S. Maillot's.

Jessica Purcell (U Texas Austin)

Geometry under reflection

Any finite volume orientable 3-manifold can be expressed as a Dehn filling on a manifold admitting a reflection: an orientation reversing involution with a 2-dimensional fixed point set. The existence of a reflection leads to certain geometric information, including geometric type, and bounds on cusp shape and volume in the case the manifold is hyperbolic. We describe these results as well as applications to the geometry of knot complements in S^3.

Alan Reid (U Texas Austin)

Heegaard genus and Property τ for hyperbolic 3-manifolds.

In this talk we will discuss the proof of existence of co-final towers of covers of any compact hyperbolic 3-manifold for which Heegaard gradient is positive. The proof exploits the connections with towers having Property τ.

Martin Scharlemann (UC Santa Barbara)

A 3-dimensional reimbedding strategy for the 4-dimensional Schoenflies Conjecture

A proof of the generalized Property R Conjecture in dimension 3 could be useful in proving the Schoenflies Conjecture in dimension 4. Part of the proposed strategy requires a Fox type reimbedding of a 3-dimensional cross-section $M^3 \subset S^3 \times 0 \subset S^4$ in a usefully natural way. For example, if M lies inside a knotted solid torus, a natural reimbedding of M would be to unknot the solid torus in which lies. Sadly, when M lies inside a higher genus knotted handlebody W, there isn't such a natural choice of reimbedding. But for the special case in which W is gotten by tubing together two distant solid tori there is a natural choice: both unknot the tori and straighten the tube. We show how this case alone suffices to prove the genus three, 4-dimensional Schoenflies Conjecture.

Jennifer Schultens (UC Davis)

The width complex for knots and 3-manifolds

We introduce a new complex that captures key information concerning thin positions for knots and 3-manifolds. We also rephrase known results in the language of this complex, discuss a few results and state many conjectures concerning this complex.

Stephan Tillmann (Melbourne)

The Thurston norm via normal surfaces

I will describe an algorithm to compute the unit ball of the Thurston norm using normal surface theory. Applications include an algorithm to decide whether a 3-manifold fibres over the circle. This is joint work with Daryl Cooper.

Genevieve Walsh (Tufts)

Commensurability classes of 2-bridge knots

(Joint work with Alan Reid.) Two three-manifolds are said to be commensurable if they share a common finite-sheeted cover. We discuss commensurability classes of knot complements, and prove that every hyperbolic two-bridge knot is the unique knot complement in its commensurability class. We speculate on and give a conjecture regarding the general case. We will also show that, generically, knots which are commensurable are cyclically commensurable.