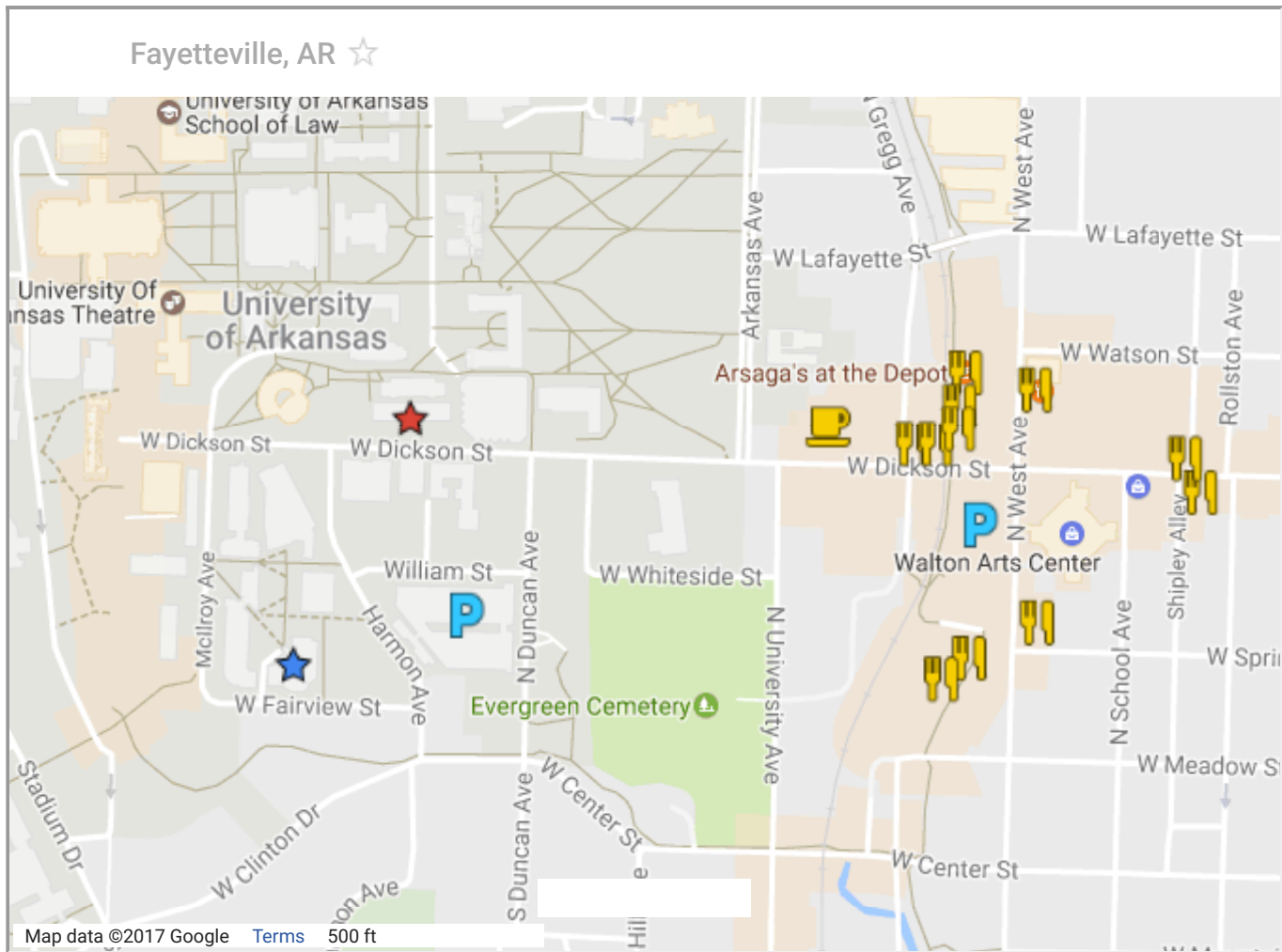


Redbud Topology Conference

University of Arkansas, Fayetteville, Arkansas: April 27 – 29, 2017



Restaurants near to campus:

Arsaga's	548 W Dickson St.	local crepes (\$\$)
Bordinos	310 W Dickson St.	italian (\$\$\$)
Deluxe Burger	550 W Dickson St.	burgers (\$\$)
Emelia's Kitchen	540 W Dickson St.	mediterranean (\$\$)
Flying Burrito	540 W Dickson St.	burrito bar (\$)
Hammontree's	326 N West Ave.	fancy grilled cheese (\$\$)
Hog Haus Brewing	430 W Dickson St.	brew pub (\$\$)
Jimmy John's	518 W Dickson St.	sandwiches (\$)
Marley's	609 W Dickson St.	pizza (\$\$)
Rolando's	509 W Spring St.	latino (\$\$)

Banquet: Friday at the Garden Room (215 W Dickson St.). There will be a cash bar starting at 5:30PM; food will be served at 6:00PM.

Schedule: The talks are on the University of Arkansas campus in the room as indicated. Abstracts follow.

Thursday, April 27 (Graduate Student Session SCEN 322)

Time	Speaker	Talk
12:00 – 12:50	Hannah Alpert	Shapes of balls in step 2 nilpotent groups
1:05 – 1:55	Sam Taylor	Hyperbolic manifolds, fibered faces, and subsurface projections
2:10 – 3:00	Andrew Sale	Outer automorphism groups of right-angled Artin groups
3:00 – 3:30	refreshments	
3:30 – 4:20	Vincent Guirardel	Avatars of small cancellation

Friday, April 28 (RCED 111)

Time	Speaker	Talk
8:00 – 8:50	coffee	
8:50 – 9:00	welcome	
9:00 – 9:50	Mark Feighn	The boundary of the free splitting graph
10:05 – 10:55	Kasra Rafi	Counting lattice points in Thurston's asymmetric metric on Teichmüller space
11:10 – 12:00	Priyam Patel	Algebraic and topological properties of big mapping class groups
12:00 – 2:00	lunch	
2:00 – 2:50	Hannah Alpert	Can arbitrarily many segments of a fixed length spin independently in the unit disk?
3:05 – 3:55	Sam Taylor	Veering triangulations and fibered faces of 3-manifolds
4:10 – 5:00	Vincent Guirardel	Boundary amenability for $\text{Out}(F_n)$

Saturday, April 29 (SCEN 408)

Time	Speaker	Talk
8:00 – 8:30	coffee	
8:30 – 9:20	Moon Duchin	Nilpotent geometry in the semi-large
9:35 – 10:25	Ilya Kapovich	A polynomial time algorithm for detecting fully irreducible automorphisms
10:25 – 10:55	coffee	
10:55 – 11:45	Andrew Sale	The outer automorphism group of a right-angled Coxeter group is either large or virtually abelian
12:00 – 12:50	Khalid Bou-Rabee	The Primitive Burnside Problem

Abstracts:

[Hannah Alpert](#), Brown University

Title: Shapes of balls in step 2 nilpotent groups

Abstract: Each oriented loop in the plane encloses a signed area. Given an oriented loop in 3-space, we can project it to the three coordinate hyperplanes and record the three signed areas. In the reverse direction, given the three signed areas, what is the L^1 -shortest loop in 3-space that gives those areas? Questions like this one are the continuous analogue of questions about balls under word length in generalizations of the Heisenberg group. The questions turn out to be disappointingly complicated. Joint work with Moon Duchin.

Title: Can arbitrarily many segments of a fixed length spin independently in the unit disk?

Abstract: The classical Kakeya needle problem asks, what is the infimal area of a region of the plane in which a unit segment can turn all the way around, perhaps translating as it does so? We can ask an analogous question for multiple segments in the unit disk. Can n segments of length r turn all the way around—that is, can they form the whole n -dimensional torus of possible angles—if they are allowed to translate as they turn? As n gets large, must r approach zero? This question comes from questions about the cohomology of the space of ways to arrange n disjoint disks of radius r in the unit disk.

[Khalid Bou-Rabee](#), The City College of New York

Title: The Primitive Burnside Problem

Abstract: Let $P(a,k)$ be the subgroup of the rank a free group generated by k th powers of primitive elements. We show that $P(2,k)$ is finite index if and only if $k = 1$ or 2 or 3 . We frame this as a solution to the Primitive Burnside Problem and discuss applications to the Bounded Burnside Problem. This covers joint work with Patrick W. Hooper.

[Moon Duchin](#), Tufts University

Title: Nilpotent geometry in the semi-large

Abstract: I'll describe elements of several related projects that aim to tie the sub-Finsler geometry of nilpotent Lie groups to the group-theoretic properties of finitely-generated nilpotent groups.

[Mark Feighn](#), Rutgers University-Newark

Title: The boundary of the free splitting graph

Abstract: The outer automorphism group $\text{Out}(F_n)$ of the rank n free group F_n acts isometrically on the free splitting graph, proven to be hyperbolic by Handel–Mosher. I will discuss joint work with Mladen Bestvina and Patrick Reynolds describing the boundary of this space.

Vincent Guirardel, Université de Rennes 1

Title: Avatars of small cancellation

Abstract: In general, given a finite presentation of a group, it is very difficult (in fact algorithmically impossible) to understand the group it defines. Small cancellation theory was developed as a combinatorial condition on a presentation that allows one to understand the group it represents. This very flexible construction has many applications to construct examples of groups with specific features. Thurston's Dehn filling theorem is a fundamental theorem in 3-manifold theory asserting that given a finite volume hyperbolic manifold with a cusp, all but finitely many manifolds obtained by Dehn surgery on the cusp carry a hyperbolic metric. I will show that these two results are two faces of a single theorem that applies to many groups acting on hyperbolic spaces.

Title: Boundary amenability for $\text{Out}(F_n)$

Abstract: We prove that $\text{Out}(F_n)$ is boundary amenable. More generally, we prove that this holds for automorphism groups of relatively hyperbolic groups under natural hypotheses on the parabolic groups, and for automorphism groups of right-angled Artin groups. This implies the Novikov conjecture for such automorphism groups. This is a joint work with Mladen Bestvina and Camille Horbez.

Ilya Kapovich, University of Illinois Urbana-Champaign

Title: A polynomial time algorithm for detecting fully irreducible automorphisms

Abstract: In an earlier paper we provided an algorithm to decide whether or not an element $\varphi \in \text{Out}(F_N)$ is fully irreducible. At several points that algorithm was rather inefficient as it involved some general enumeration procedures as well as running several abstract processes in parallel. We refine our earlier algorithm by eliminating these inefficient features, and also by eliminating any use of mapping class groups algorithms. For a fixed $N \geq 2$, the improved algorithm decides whether $\varphi \in \text{Out}(F_N)$ is fully irreducible in polynomial time in terms of the size of a topological representative of φ . This work is joint, in part, with Mark Bell.

Priyam Patel, University of California, Santa Barbara

Title: Algebraic and topological properties of big mapping class groups

Abstract: The mapping class group of a surface is the group of homeomorphisms of the surface up to isotopy (a natural equivalence). Mapping class groups of finite type surfaces have been extensively studied and are, for the most part, well-understood. There has been a recent surge in studying surfaces of infinite type and in this talk, we shift our focus to their mapping class groups, often called big mapping class groups. The groups arise naturally when studying group actions on surfaces (dynamics) and foliations of 3-manifolds. In contrast to the finite type case, there are many open questions regarding the basic algebraic and topological properties of big mapping class groups. Until now, for instance, it was unknown whether or not these groups are residually finite. We will discuss the answer to this and several other open questions after providing the necessary background on surfaces of infinite type. This work is joint with Nicholas G. Vlamis.

[Kasra Rafi](#), University of Toronto

Title: Counting lattice points in Thurston's asymmetric metric on Teichmüller space

Abstract: Following the work of Mirzakhani and Souto–Erlandsson, we consider the mapping class group orbit of a filling geodesic current and show that a certain average of these measures converges to Thurston's measure on the space of measured laminations. We use this result to count the number of lattice points in the ball of radius R in Teichmüller space equipped with Thurston's asymmetric metric. This is a joint work with Juan Souto.

[Andrew Sale](#), Vanderbilt University

Title: Outer automorphism groups of right-angled Artin groups

Abstract: Right-angled Artin groups (RAAGs) give a way of bridging the gap between free abelian groups and free groups within the world of finitely presented groups. Their outer automorphism groups therefore interpolate between $GL(n, \mathbb{Z})$ and $Out(F_n)$. These two classes of groups share many properties, which has led many people to draw analogies between them. Of these properties, we can ask which are also shared by $Out(A_\Gamma)$, for any RAAG A_Γ . There are also properties where they differ, and then we can ask where the boundary occurs between the contrasting properties. We'll discuss a way to approach these problems, looking at a generating set for $Aut(A_\Gamma)$, and discuss some notable results.

Title: The outer automorphism group of a right-angled Coxeter group is either large or virtually abelian

Abstract: In the study of automorphisms of graph products of cyclic groups (including RAAGs and RACGs), a separating intersection of links (SIL) has been shown to hold a lot of power. The reason for this is that a SIL is exactly the necessary condition on the underlying graph that determines when two partial conjugations do not commute. We introduce two variations on a SIL that give a combinatorial condition on a right-angled Coxeter group that determine the dichotomy given in the title: the outer automorphism group of a RACG has a finite index subgroup that is either abelian or maps onto F_2 . This is joint work with Tim Susse.

[Sam Taylor](#), Yale University

Title: Hyperbolic manifolds, fibered faces, and subsurface projections

Abstract: In preparation for my talk on veering triangulations, we'll summarize the basic theory of how a 3-manifold can fiber over the circle. When the manifold is hyperbolic, a natural question arises: How is the geometry of M determined by the topology/combinatorics of the fibration? Addressing this question is complicated by the fact that M can fiber in infinitely many distinct ways! To explore these various fibrations, we'll discuss the Masur–Minsky subsurface projections as a central tool.

Title: Veering triangulations and fibered faces of 3-manifolds

Abstract: From a pseudo-Anosov homeomorphism of a surface, Agol's veering triangulation gives a canonical ideal triangulation of the associated mapping torus punctured along singular fibers. By recent work of Gueritaud, this triangulation can be directly obtained from the stable and unstable laminations of the monodromy. We study the way in which these triangulations interact with the arc complexes of fibers and their subsurfaces. In particular, we find that the veering triangulation records the hierarchy of subsurface projections associated to each fiber in a fibered face of the Thurston norm ball. These projections are in fact visible as embedded subcomplexes of the veering triangulation itself. Through this structure, we obtained explicit control over the size and nature of subsurface projections occurring over a fixed fibered face. This is joint work with Yair Minsky.