Spring 2022

- **February 3rd**
  Speaker: **Sarah Blackwell** (U Georgia) (online talk)
  Title: **Triple Knot Grid Diagrams** *Abstract:* In this talk I will introduce a project I have been working on which uses trisections of 4-manfiolds to represent ``Lagrangian-like'' surfaces in $\mathbb{CP}^2$ by ``triple knot grid diagrams.'' Gay and Kirby defined a decomposition of (smooth, closed, connected, oriented) 4-manifolds called a trisection, and proved that every such 4-manifold admits this decomposition. Meier and Zupan showed that surfaces embedded in 4-manifolds inherit a trisection from the trisection of the 4-manifold. Their work includes a description of how to represent these surfaces with ``shadow diagrams.'' In this project I consider specific shadow diagrams of surfaces in $\mathbb{CP}^2$ that naturally arise as grid diagrams on the central surface of the standard (genus one) trisection of $\mathbb{CP}^2$. The result is a process for encoding Lagrangian-like surfaces which appear to be combinatorial representations of Lagrangian surfaces in $\mathbb{CP}^2$. Surprisingly, triple knot grid diagrams representing Lagrangian-like surfaces are sparse; adding the extra necessary condition makes such diagrams hard to find.

- **February 10th**
  Speaker: **Matt Zaremsky** (SUNY-Albany) (online talk)
  Title: **Higher virtual algebraic fibering of certain right-angled Coxeter groups** *Abstract:* A group is said to “virtually algebraically fiber” if it has a finite index subgroup admitting a map onto Z with finitely generated kernel. Stronger than finite generation, if the kernel is even of type F_n for some n then we say the group “virtually algebraically F_n-fibers”. Right-angled Coxeter groups (RACGs) are a class of groups for which the question of virtual algebraic F_n-fibering is of great interest. In joint work with Eduard Schesler, we introduce a new probabilistic criterion for the defining flag complex that ensures a RACG virtually algebraically F_n-fibers. This expands on work of Jankiewicz–Norin–Wise, who developed a way of applying Bestvina–Brady Morse theory to the Davis complex of a RACG to deduce virtual algebraic fibering. We apply our criterion to the special case where the defining flag complex comes from a certain family of finite buildings, and establish virtual algebraic F_n-fibering for such RACGs. The bulk of the work involves proving that a “random” (in some sense) subcomplex of such a building is highly connected, which is interesting in its own right.

- **February 17th**
  Speaker: **Rachel Skipper** (Ohio State) (online talk)
  Title: **Finiteness properties for braided and ribboned groups of homeomorphisms of the Cantor Set** *Abstract:* The braided Higman-Thompson groups were first introduced independently by Brin and Dehornoy. In this talk, we talk about some generalizations of this construction as well as how to braid self-similar groups. The focus of the talk will be on some recent work about finiteness properties of the resulting groups and how they fit into the growing field of big mapping class groups.

- **February 24th**
  Speaker: **Oğuz Şavk** (Boğaziçi University) (online talk)
  Title: **Homology 3-spheres bounding contractible 4-manifolds and homology 4-balls** *Abstract:* A central problem in low-dimensional topology asks which homology 3-spheres bound contractible 4-manifolds and homology 4-balls. In this talk, we address this problem for plumbed 3-manifolds and we present the classical and new results. Our approach is based on Mazur’s famous argument and its generalization, they together provide a unification of all recognized results.

- **March 3rd**
  Speaker: **Cary Malkiewich** (Binghamton)
  Title: **Counting periodic orbits of flows** *Abstract:* In this informal talk I'll describe work in progress on a new method for counting periodic orbits of flows, in an “algebraic” or “homological” way. The main breakthrough in recent months is the construction of a new invariant, using spectra, that simultaneously generalizes two earlier constructions by Fuller and by Geoghegan and Nicas. The computation of this invariant is work in progress, but I'll give a few examples where we can do the computation.

- **March 10th**
  Speaker: **Gabriel Islambouli** (UC Davis) (online talk)
  Title: **Stable equivalence of smooth 4-manifolds described as sequences of handlebodies**
  Abstract: Following constructions of numerous authors, one can build a smooth 4-manifold from a loop of Morse functions on a surface, a loop in the cut complex, a loop in the pants complex, or from a multisection diagram. In this talk, we will discuss these constructions, as well as outline a stable equivalence theorem for these descriptions so that, for example, any two loops of Morse functions on a surface corresponding to the same smooth 4-manifold are related by a sequence of given operations.

- **March 24th**
  Speaker: **David Mehrle** (Cornell) (in person talk)
  Title: **Towards an equivariant Hochschild—Kostant—Rosenberg Theorem** *Abstract:* The Hochschild—Kostant—Rosenberg (HKR) theorem is a bridge between algebra and geometry with applications in algebraic K-theory, Lie theory, deformation theory, and other fields. For a smooth k-algebra A, the HKR theorem gives an isomorphism between the Kähler differentials of A (a geometric object) and the Hochschild homology of A (an algebraic gadget). We conjecture that, when a finite group G acts on A by ring homomorphisms, the HKR theorem becomes a G-equivariant isomorphism. In this talk, I will share some progress towards proving this conjecture, and discuss some of the obstacles that remain. This is joint work-in-progress with J.D. Quigley and Michael Stahlhauer.

- **March 31st**
  Speaker: **Steven Gindi** (Binghamton)
  Title: **Long Time Limits of Generalized Ricci Flow** *Abstract:* We derive rigidity results for generalized Ricci flow blowdown limits on classes of nilpotent principal bundles. We accomplish this by constructing new functionals over the base manifold that are monotone along the flow. This overcomes a major hurdle in the nonabelian theory where the expected Perleman-type functionals were not monotone and did not yield results. Our functionals were inspired and built from subsolutions of the heat equation, which we discovered using the nilpotency of the structure group and the flow equations. We also use these and other new subsolutions to prove that, given initial data, the flow exists on the principal bundle for all positive time and satisfies type III decay bounds.

- **April 7th**
  Speaker: **Sam Shepherd** (Vanderbilt)
  Title: **Semistability of cubulated groups** *Abstract:* I will discuss my theorem that cubulated groups are semistable at infinity, together with background on these two concepts. I will also present a result about modifying the cubulation of a group to achieve certain geometric features, which is needed to prove the semistability theorem.

- **April 14th**
  Speaker: **Patrick Naylor** (Princeton)

Title: **Doubles of Gluck twists** *Abstract:* The Gluck twist of an embedded 2-sphere in the 4-sphere is a 4-manifold that is homeomorphic, but not obviously diffeomorphic to the 4-sphere. Despite considerable study, these homotopy spheres have resisted standardization except in special cases. In this talk, I will discuss some conditions that imply the double of a Gluck twist is standard, i.e., is diffeomorphic to the 4-sphere. This is based on joint work with Dave Gabai and Hannah Schwartz.

- **April 21st**
  Speaker: **Chaitanya Tappu** (Cornell)
  Title: **Mapping Class Group acts continuously on the marked moduli space** *Abstract:* We define a moduli space of marked hyperbolic structures on an infinite type surface, analogous to Teichmueller spaces. The mapping class group of the surface acts on this marked moduli space. For infinite type surfaces, the mapping class group is a topological group, so we can ask if the above action is continuous. We answer this in the affirmative.

- **April 28th**
  Speaker: **Matt Durham** (UC Riverside)
  Title: **Local quasicubicality and sublinear Morse geodesics in mapping class groups and Teichmuller space** *Abstract:* Random walks on spaces with hyperbolic properties tend to sublinearly track geodesic rays which point in certain hyperbolic-like directions. Qing-Rafi-Tiozzo recently introduced the sublinear-Morse boundary to more broadly capture these generic directions. In joint work with Abdul Zalloum, we develop the geometric foundations of sublinear-Morseness in the mapping class group and Teichmuller space. We prove that their sublinearly-Morse boundaries are visibility spaces and admit continuous equivariant injections into the boundary of the curve graph. Moreover, we completely characterize sublinear-Morseness in terms of the hierarchical structure on these spaces. Our techniques include developing tools for modeling sublinearly-Morse rays via CAT(0) cube complexes. Part of this analysis involves establishing a direct connection between the geometry of the curve graph and the combinatorics of hyperplanes in these cubical models.

- **May 5th**
  Speaker: **Yash Lodha** (University of Vienna)
  Title: **Some new constructions in the theory of left orderable groups** *Abstract:* : I will define two new constructions of finitely generated simple left orderable groups (in recent joint work with Hyde and Rivas). Among these examples are the first examples of finitely generated simple left orderable groups that admit a minimal action by homeomorphisms on the Torus, and the first family that admits such an action on the circle. I shall also present examples of finitely generated simple left orderable groups that are uniformly simple (these were constructed by me with Hyde in 2019). And present new examples that, somewhat surprisingly, have infinite commutator width. Finally, I will present some new results around the second bounded cohomology of these groups (joint with Fournier-Facio).