Fall 2017

- **July 17**
  Speaker: **Collin Bleak** (University of St. Andrews)
  Title: **On Finite generation for groups of homeomorphisms of Cantor spaces** Abstract: Given a Cantor space c, we define a broad class of subgroups of the group of homeomorphisms of c so that, if a given group G is a subgroup of a finitely generated subgroup H of $Homeo(c)$, and is in our class, then we can immediately conclude that G is two-generated. The argument has connections with Higman and Epstein's general arguments toward simplicity for groups of homeomorphisms, and is general enough to immediately prove two-generation, e.g., for many relatives of the Thompson groups, and many other groups as well. Joint with James Hyde.

- **August 24** Organizational meeting

- **August 31** (Joint with combinatorics)
  Speaker: **Olakunle Abawonse** (Binghamton University)
  Title: **Topological Tverberg Theorem (prime power case)** *Abstract:* We will solve some discrete geometry problems using methods of equivariant topology. This talk is based on the paper “Beyond The Borsuk-Ulam Theorem – The Topological Tverberg Story” by Blagojevic and Ziegler. Topological techniques ranging from the Borsuk-Ulam theorem to spectral sequences will be used in solving these problems.

- **September 7**
  Speaker: **Casey Donoven** (Binghamton University)
  Title: **Topology of Fractals** *Abstract:* Invariant factors are quotients of Cantor space that generalize the topology of certain fractals. They provide insight into the topology of self-similar sets and Julia sets and are interesting in their own right. Under certain conditions, invariant factors are inverse limits of finite topological spaces realizable as finite graphs. In this talk, I will present basic definitions and results pertaining to invariant factors and motivate them through poorly-drawn examples of self-similar fractals.

- **September 14**
  Speaker: **Jun Zhang** (Tel Aviv University)
  Title: **Applications of persistent homology in symplectic and Riemannian geometry** *Abstract:* In this talk, I will start from a brief introduction of persistent homology and its related formulations from the perspective of symplectic geometry, especially in various forms of Floer theory. Then I will quickly demonstrate via several examples how persistent homology is used in symplectic geometry, for instance in solving some (Hamiltonian) dynamical problems. Finally, I will focus on a recent work (joint with V. Stojisavljevic) on an application in Riemannian geometry - quantitatively comparing Riemannian metrics, which is based on a newly developed concept called symplectic Banach-Mazur distance.

- **September 21** (no seminar - Rosh Hashahah)

- **September 28**
  Speaker: **Oleg Lazarev** (Columbia University)
  Title: **Contact manifolds with flexible fillings** *Abstract:* In this talk, I will show that all flexible Weinstein fillings of a given contact manifold have isomorphic integral cohomology. As an application, in dimension at least 5 any almost contact class that has an almost Weinstein filling has infinitely many exotic contact structures. Using

similar methods, I will also construct an infinite family of almost symplectomorphic Weinstein domains whose contact boundaries are not contactomorphic. These results are proven by studying Reeb chords of loose Legendrians and positive symplectic homology.

- **October 5**
  Speaker: **Michael Cohen** (North Dakota State University)
  Title: **Polishability of some groups of interval and circle diffeomorphisms** *Abstract:* Consider a group G consisting of all C^k diffeomorphisms of the circle whose derivatives satisfy a regularity condition arising from classical real analysis: a Lipschitz/Hoelder condition; absolute continuity; or bounded total variation. Is it possible to assign a separable complete metric topology to G, in such a way that the group operations become continuous? If so, G is called Polishable. I'll discuss this Polishability problem in the cases mentioned above, where the answer turns out to vary dramatically depending on the choice of analytic condition. In particular, I'll exhibit an infinite class of what appear to be new Polish topological groups.

- **October 12**
  Speaker: **Robert Kropholler** (Tufts University)
  Title: **Uncountably many QI classes of groups of type FP** *Abstract:* The first groups of type FP which were not of type F were discovered by Bestvina and Brady in 1997. More recently Leary has shown that there are uncountably many groups of type FP. In 1998 Bowditch showed that there uncountably many QI classes of 2-generator groups. In joint work with Ian Leary and Ignat Soroko, we combine these ideas and prove there are uncountably many QI classes of groups of type FP. I will discuss the previous work of Bestvina, Brady, Bowditch and Leary leading up to this project and then talk about how these elements come together.

- **October 19**
  Speaker: **Ramón Vera** (Institute of Mathematics, National Autonomous University of Mexico)
  Title: **Poisson Structures of near-symplectic Manifolds** *Abstract:* In this talk we will show a connection between two singular geometric structures: near-symplectic forms and Poisson structures. Near-symplectic forms were introduced by Taubes as a way of generalizing symplectic topology in dimension 4. These structures are closely related to broken Lefschetz fibrations, which can be seen as extensions of Lefschetz pencils. We will describe some aspects of near-symplectic manifolds in any dimension 2n. On the other hand, Poisson structures have their origin in Classical Mechanics. A Poisson bivector naturally determines a singular foliation by symplectic leaves. We will discuss the link between these geometries and some features of their Poisson cohomology. This is joint work with P. Batakidis.

- **October 26**
  Speaker: **Adam Saltz** (University of Georgia)
  Pictorial link homology (and Floer homology?): **TBA** *Abstract:* First, I'll describe Bar-Natan's amazing reformulation of Khovanov homology using diagrams and cobordisms (and a bit of category theory) rather than linear algebra. This will be totally accessible to graduate students! Then I'll tell you about a strategy to show that link cobordisms induce well-defined maps on “Khovanov-Floer theories” (Floer homology theories which admit spectral sequences from Khovanov homology). This strengthens a result of Baldwin, Hedden, and Lobb. I also think it's a good start on parametrizing these theories, and I'll tell you how.

- **November 2**
  Speaker: **Eugenia Sapir** (Binghamton University)
  Title: **Long geodesics on surfaces** *Abstract: I will talk about a recent result of Athreya, Lalley, Wroten and myself. Given a hyperbolic surface S, a typical long geodesic arc will divide the surface into many polygons. We give statistics for the geometry of this tessellation. Along the way, we look at how long geodesic arcs behave in*

*very small balls on the surface.*TBA

- **November 9**
  Speaker: **Cary Malkiewich** (Binghamton University)
  Title: **Periodic points and equivariant stable homotopy theory** *Abstract:* The Lefschetz number $L(f)$ and Reidemeister trace $R(f)$ are invariants that detect fixed points of a map $f: X \to X$. I will talk about the generalizations of these invariants that detect n-periodic points of f, and an ongoing project with Kate Ponto that involves showing that periodic-point problems and equivariant fixed-point problems are controlled by the same invariants. Along the way we will see some equivariant stable homotopy theory, and some arguments that amount to ``unwinding'' a string to show that a more complicated invariant reduces to a simpler one. These arguments allow us to resolve a conjecture of Klein and Williams; it still remains to connect them to related work of Geoghegan and Nicas on flows.

- **November 16**
  Speaker: **Mark Sapir** (Vanderbilt University)
  Title: **Divergence functions of R. Thompson groups** *Abstract:* This is a joint work with Gili Golan. The divergence function of a group generated by a finite set X is the smallest function $f(n)$ such that for every n every two elements of length n can be connected in the Cayley graph (corresponding to X) by a path of length at most $f(n)$ avoiding the ball of radius $n/4$ around the identity element. We prove that R. Thompson groups F, T, V have linear divergence functions. Therefore the asymptotic cones of these groups do not have cut points.