The Farrell-Jones conjecture for free-by-cyclic groups

Mladen Bestvina - University of Utah

Abstract: The Farrell-Jones conjecture for a given group is an important conjecture in manifold theory. I will review some of its consequences and will discuss a class of groups for which it is known, for example 3-manifold groups. Finally, if there is time, I will discuss a proof that free-by-cyclic groups satisfy FJC, answering a question of Lück. This is joint work with Koji Fujiwara and Derrick Wigglesworth.

Curvature

James Cannon - Brigham Young University (emeritus)

Abstract: Curvature can be approached in a very satisfying way by considering polyhedral surfaces in Euclidean 3-space.

The Specker theorem and non-commutative duality

Katsuya Eda - Waseda University

Abstract: History of wild topology.

Using the Hawaiian earring to detect local properties of fundamental groups

Jeremy Brazas - West Chester University

Abstract: In this talk, I will discuss joint work with H. Fischer that develops a unified framework for characterizing and comparing a number of local properties of fundamental groups by constructing closure operators on the $\pi_1$-subgroup lattice in terms of maps from a fixed “test” domain.

In general, the homotopically Hausdorff property is implied by the existence of a generalized universal covering. Motivated, in part, by K. Eda’s question regarding the equivalence of these two properties for Peano continua, we use the Hawaiian earring as a test-space to study an intermediate property: the well-definedness of transfinite products. We will conclude with an open yes/no question about the Hawaiian earring group for which either answer has an interesting implication.

Cotorsion-free groups and related local properties of fundamental groups

Hanspeter Fischer - Ball State University

Abstract: We first discuss a theorem that is joint work with K. Eda: An abelian group $G$ is cotorsion-free if and only if $G$ is homomorphically Hausdorff relative to every Peano continuum $X$, i.e., for every homomorphism $h : \pi_1(X, x) \to G$ from the (appropriately topologized) fundamental group, the image of $h$ (viewed as a quotient map) is Hausdorff.

Every residually $n$-slender group (e.g. every residually free group) is homomorphically Hausdorff relative to every Peano continuum. If the fundamental group $\pi_1(X, x)$ of a Peano continuum $X$ is residually $n$-slender, then $X$ admits a generalized universal covering space.

We then present an extension of the latter result to general metric spaces, which is joint work with J. Brazas. For this, we initially change the topology on $\pi_1(X, x)$ and then discuss various notions of subgroups being “closed” that are not associated with any topology on $\pi_1(X, x)$. Using this new point of view, we also show that $1-UV_0$ metric spaces admit generalized universal covering spaces. (Here, a space is called $1-UV_0$ if small null-homotopic loops have small contractions.)
The similarities of wildernesses
Wolfram Hojka

Abstract: “Happy families are all alike; every unhappy family is unhappy in its own way.” If we apply the Anna Karenina principle to wild topology, it seems that wild spaces must be generally happy. For very often they will be quite alike with respect to their algebraic properties. And “making spaces wild” by various constructions occasionally crushes what rich structure the original tame spaces had to offer. This talk contains archipelagos, sausages, theorems, conjectures, and questions.

Freely Indecomposable Groups
Wolfgang Herfort - University of Technology, Vienna, Austria

Abstract: It is proved that groups with a certain property, termed by us $U$-Higman complete cannot split as free product. From this somewhat technical result a number of facts like free indecomposability of inverse limits of groups and non discrete locally compact groups follow quickly. Using our device, another proof of a result of K. Eda concerning mapping an inverse limit of groups to the topologist’s product of groups is given. Joint work with Wolfram Hojka.

On totally functorialy equivalent spaces
Umed Karimov - Institute of Mathematics, Tajik Academy of Science, Dushanbe, Tajikistan

Abstract: Let $X$ and $Y$ are two topological spaces and $F$ is any functor which is defined for all subspaces of the spaces $X$ and $Y$. We say that $X$ and $Y$ are totally $F$-equivalent if there exists a bijection $f : X \to Y$ such that for any subspace $A$ of $X$ the objects $F(A)$ and $F(f(A))$ are isomorphic and the mappings generated by the imbeddings $B \subset A$ are the same. We will discuss this conception and formulate some results for the functors of Cech cohomology, the Steenrod-Sitnikov homology. We will formulate some open problems.

On covering maps over groups
Vlasta Matijević - University of Split, Croatia

Abstract: In this talk, I will present some results related to a problem of existence of group structures on covering spaces over groups; obtained in a joint work with Katsuya Eda. Precisely, we were interested in the following question: If $f : X \to Y$ is a covering map from a connected space $X$ onto a Hausdorff group $Y$; is it possible to define a group operation on $X$ in such a way that $X$ becomes a topological group and $f$ a homomorphism of groups? We answered the question in the negative by constructing infinite-sheeted covering maps over solenoids which do not admit such group operation on total spaces. However; the answer is positive in two particular cases: if $Y$ is a locally path connected group or if $f$ is an overlay map over a compact group. Note that overlay maps are a certain proper subclass of covering maps. We extended positive answers to covering maps over locally compactly connected groups and to overlay maps over locally compact groups. In both cases the group operation on $X$ is unique and defined by lifting of chains of open sets.
Semistability of Relatively Hyperbolic Groups

*Michael Mihalik - Vanderbilt University*

**Abstract:** Suppose $G$ is a 1-ended finitely generated group that is hyperbolic relative to $P$, a finite collection of 1-ended finitely generated proper subgroups of $G$. Our main theorem states that if the boundary $\partial (G, P)$ has no cut point, then $G$ has semistable fundamental group at $\infty$. Under mild conditions on $G$ and the members of $P$ the 1-ended hypotheses and the no cut point condition can be eliminated to obtain the same semistability conclusion. We give an example that shows our main result is somewhat optimal. Finally, we improve a “double dagger” result of F. Dahmani and D. Groves.

This is joint work with Eric Swenson.

Geometric Groupoid Models for $C^*$ algebras

*Atish Mitra - Montana Tech*

**Abstract:** We use ideas from geometric topology to construct groupoid models for certain $C^*$ algebras.

We define a generalized inverse system of groupoids with partial morphisms as bonding maps and we show that such systems generally have inverse limits, and that the groupoid $C^*$-algebra of this inverse limit is the inductive limit of the groupoid $C^*$-algebras in the induced directed system. We demonstrate our techniques to provide groupoid models of some well known $C^*$ algebras built from inductive systems. The distinctive features of our method is that our groupoid modeling is functorial, and easy to visualize geometrically.

This is joint work with K. Austin.

How do we count components of a lifting space?

*Petar Pavesic - University of Ljubljana*

**Abstract:**

Fibrators among Manifolds with Perfectly-Hopfian Fundamental Groups

*Violeta Vasilevska - Utah Valley University*

**Abstract:** In this talk we first introduce a particular type of Hopfian groups (called perfectly-Hopfian groups) and discuss their properties. It will be shown how important these special groups are as fundamental groups of shape $m_{\text{simp}}$ fibrators. Shape $m_{\text{simp}}$ fibrators are manifolds that can “detect” approximate fibrations in a “special” PL setting. In the second part of the talk, the shape $m_{\text{simp}}$ fibrators properties of Hopfian manifolds (having perfectly-Hopfian fundamental groups) and their products will be discussed.

Comparing topologies on the universal path space

*Žiga Virk - University of Ljubljana*

**Abstract:** Given a path-connected space, we will compare four topologies on the universal path space: the Whisker topology, the Lasso topology, the topology induced by the compact open topology on paths/loops, and the topology $\tau$ introduced by Brazas. The four topologies are discrete on locally path-connected, semi-locally simply-connected spaces. In general, however, the topologies may differ widely. For example, restrictions of only two of these topologies turn the fundamental group into a topological group.

Joint work with Andreas Zastrow.
On the history of wild algebraic topology

Andreas Zastrow - University of Gdansk

Abstract: The systematic research on wild algebraic topology started with the first papers of Katsuya Eda on the Hawaiian Earring at the beginning of the nineties. In order to understand why certain questions of algebraic topology have so long been neglected, one should be aware of two papers of Milnor from around 1960: On the one hand he and Barratt gave an example of a two-dimensional space with a non-trivial third singular homology group ([2]), and on the other hand he was advertising the category of spaces homotopy equivalent to CW-complexes as a convenient category for algebraic topology ([1]). Probably [2] and similar discoveries of that times and the proposition [1] have caused that the classes of spaces that are usually under consideration in general and in algebraic topology are really different: While spaces beyond the category of Milnor were usually included when trying to phrase (e.g.) characterization theorems from general topology, the vast majority of results from algebraic topology were restricted either to tame spaces (i.e. to spaces proposed by Milnor in [1]), or were restricted to spaces satisfying local conditions (that are naturally satisfied by tame spaces), or to those types of algebraic invariants which are defined on that basis, that if spaces can in some sense be approximated by tame spaces, the limits of the algebraic invariants of the tame space are defined to become those of the non-tame limit-spaces. While the latter invariants have been proven to be useful in some situations, they have (of course), also a natural built-in disadvantage: They are never able to capture topological properties, that just change when passing from the tame approximating spaces to the wild limits (wild = non-tame). However, it has only rarely happened before the nineties, that mathematicians tried to shed light on what is going on with the most widely used algebraic invariants (the fundamental groups and singular homology groups) for spaces beyond Milnor’s category. The talk will briefly describe the methods that have been developed in the last 25 years for computing these algebraic invariants for some examples (e.g. [3; 4, Thm. 1.6; 5]) and for understanding their behaviour, with the hope that one day algebraic topology will for wild spaces become an as useful and standard tool as it has been half a decade before already for tame spaces. It will also briefly describe some other kinds of results to which this research has led (e.g. [6]).