Algebraic Topology Conference- Buenos Aires, November 2008
Abstracts

Andres Angel. *Cobordisms of orbifolds*

Orbifolds are useful generalizations of manifolds that appear naturally in the study of moduli spaces, particularly those arising in Gromov-Witten theory, where in good cases, these moduli spaces are orbifolds and Gromov-Witten invariants are suitably defined characteristic numbers.

In this talk I will present a framework to study cobordism of orbifolds. As application, I will show calculations of several cobordism groups of orbifolds in terms of usual smooth bordism theory, these decompositions involve information around the singular sets and provide a way to define invariants for orbifolds.

Andrew Baker. *Galois extensions of the $K(n)$-local sphere*

The notion of a Galois extension of commutative S-algebras ($= E_\infty$ ring spectra) was introduced by John Rognes. While algebraic Galois theory embeds into stable homotopy theory via Eilenberg-MacLane spectra, there are many more subtle examples than those coming from algebra. For example, $KO \to KU$ gives an example of a Galois extension with group C_2. Rognes showed that the sphere spectrum admits no connected Galois extensions with finite Galois group, essentially because there are no unramified Galois extensions of the rationals. On the other hand, the $K(n)$-local sphere $S_{K(n)}$ spectrum admits the Lubin-Tate spectra as Galois extensions with profinite Galois group. I will discuss this and a recent result with Birgit Richter which determines the 'algebraic closure' of $S_{K(n)}$.

Noe Barcenas. *Equivariant cohomotopy for infinite groups and the Segal conjecture for families*

This is part of mi Ph.D. Project, supervised by Wolfgang Lueck. In this talk, I shall discuss the extension of equivariant cohomotopy in the framework of proper actions. I shall give a proof of the Segal conjecture for families of discrete subgroups in this context.

Jonathan Barmak. *Equivariant collapses and a conjecture of Quillen*

In 1978, D. Quillen studies homotopy properties of the simplicial complex $\mathcal{K}(S_p(G))$ associated to the poset $S_p(G)$ of nontrivial p-subgroups of a finite group G. If G has a nontrivial normal p-subgroup, $\mathcal{K}(S_p(G))$ is contractible. Quillen conjectures the converse, which is still an open problem. In 1984, R.E. Stong attacks this conjecture from the finite space point of view and proves that G has a nontrivial normal p-subgroup if and only if the finite space $S_p(G)$ is contractible.

In this talk I will recall the relationship between the homotopy and simple homotopy theory of finite topological spaces and polyhedra and Stong's approach to the equivariant homotopy theory of finite spaces. I will introduce the notion of G-collapse of simplicial complexes, which is an equivariant version of Whitehead's collapses, and I will show how this is related to an analogous concept for finite spaces. As a consequence of these ideas we will deduce that G has a nontrivial normal p-subgroup if and only if $\mathcal{K}(S_p(G))$ is G-collapsible.

Maria Basterra. *Topological Quillen Cohomology*

In his seminal work "Homotopical Algebra", D. Quillen defined cohomology in a general model category in terms of the derived functor of abelianization. In this talk I will report on joint work with Mike Mandell investigating Quillen cohomology in categories of highly structured ring spectra. I will present several perspectives and some of the results obtained from the different view points.

Carles Casacuberta. *Supercompact cardinals imply reflectivity of absolute orthogonality classes in locally presentable categories*

It is known that the solutions of certain problems in homotopy theory depend on the choice of set-theoretical foundations. For example, if one assumes the existence of sufficiently large cardinals, then all localizing ideals are coreflective and all colocalizing coideals are reflective in triangulated categories derived from combinatorial monoidal model categories. This implies, among many other things, the existence of cohomological localizations of spectra.

In a joint work with Bagaria, Mathias and Rosický, we achieve a clearer understanding of the way in which large cardinals ensure the existence of localizations. We prove that, if there is a supercompact cardinal above any given cardinality, then every absolute orthogonality class in a locally presentable category is reflective. (A class of objects is absolute if it can be defined by a formula without unbounded quantifiers.) Moreover, we exhibit a sequence of large-cardinal statements $\mathrm{VP}(n)$, defined in terms of the Lévy hierarchy and converging to Vopenka's principle, such that the validity of $\mathrm{VP}(n)$ implies reflectivity of orthogonality classes definable by formulas with less than n unbounded quantifiers in locally presentable categories.

Michael Ching . *Operads and the chain rule for Goodwillie calculus*

I'll describe joint work with Greg Arone on the chain rule for Goodwillie's calculus of homotopy functors. For functors of stable model categories such as spectra, this chain rule takes a simple form that mirrors the chain rule for higher derivatives in everyday calculus. In the unstable case, this formula must be adjusted to take into account the operad formed by the derivatives of the identity functor.

Rafael Diaz. *Homological Quantum Field Theory*

We show that the space of chains of smooth maps from spheres into a fixed compact oriented manifold has a natural structure of a transversal d-algebra. We construct a structure of transversal 1-category on the space of chains of maps from a suspension space S(Y), with certain boundary restrictions, into a fixed compact oriented manifold. We define homological quantum field theories HLQFT and construct several examples of such structures. Our definition is based on the notions of string topology of Chas and Sullivan, and homotopy quantum field theories of Turaev.

Soren Galatius. *Spaces of graphs and automorphisms of free groups*

I will define and discuss the homotopy type of a certain space of graphs embedded in Euclidean space. I will explain how to use this to construct a Pontrjagin-Thom type map for finite graphs. This will lead to a calculation (math/0610216) of the homology of $Aut(F_n)$ in the "stable range". Here F_n is a free group on n generators and $Aut(F_n)$ is its automorphism group. Hatcher and Vogtmann established a stable range: $H_k(Aut(F_n))$ is independent of n as long as $n > 2k + 1$.

Eduardo Hoefel. *OCHA and the Swiss-Cheese Operad*

In this work we show that the relation between Kajiura-Stasheff's OCHA and A. Voronov's Swiss-Cheese Operad is analogous to the relation between SH Lie algebras and the little discs operad. More precisely, we show that the OCHA operad is quasi-isomorphic to the operad generated by the top-dimensional homology classes of the Swiss-Cheese Operad.

Mark Hovey. *Homological dimensions of ring spectra*

In this joint work with Keir Lockridge, we develop theories of global and weak dimension for structured ring spectra. These dimensions are related to the global and weak dimensions of the homotopy rings, but the precise nature of this relationship remains unclear. We provide partial classification results and some conjectures in cases where the dimensions of these ring spectra are finite.

Matias del Hoyo. *On the classifying space of a (co)fibred category*

In this talk we will describe two ways on which fibred categories give rise to bisimplicial sets: the fibred nerve and the cleaved nerve. The fibred nerve is a natural extension of Segal's classical nerve of a category, and it is proved to be an alternative simplicial description of the homotopy type of the total category. If the fibration is splitting, then one can construct the cleaved nerve, a smaller variant which emerges from a distinguished closed cleavage. We will interpret some classical results by Thomason and Quillen in terms of our constructions, and derive some other applications such as spectral sequences for homology and transfer maps for group actions.

Niles Johnson. *Morita theory for derived categories: A bicategorical perspective*

This talk will present a bicategorical perspective on derived Morita theory for rings, DG algebras, and spectra. This perspective draws a connection between Morita theory and the bicategorical Yoneda Lemma, yielding a conceptual unification of Morita theory in derived and bicategorical contexts. We will introduce the necessary categorical background and use this to explain both the successes and the difficulties of derived Morita theory.

Daniel Juan Pineda. *Lower algebraic K-theory of braid groups of the proyective plane*

We will present some calculations of the lower algebraic K-theory for group rings of the braid groups of the projective plane. The special case of three braids will be presented in detail. In this case some higher algebraic K-theory groups are also indicated.

Michael Mandell. *Localization Sequences in THH and TC*

This talk is about joint work with Blumberg that constructs localization cofiber sequences for the topological Hochschild homology (THH) and topological cyclic homology (TC) of spectral categories. Using a "global" construction of the THH and TC of a scheme in terms of the perfect complexes in a spectrally enriched version of the category of unbounded complexes, the sequences specialize to localization cofiber sequences associated to the inclusion of an open subscheme. These are the targets of the cyclotomic trace from the localization sequence of Thomason-Trobaugh in K-theory.

Peter May. *Categories, posets, Alexandrov spaces, and simplicial complexes*

Since most people may still be jet-lagged, I'll give an old-fashioned elementary talk on some neo-classical topics relating the modelling of the unstable homotopy category by categories, posets, Alexandrov spaces, and simplicial complexes. In particular, I'll recall how to model finite simplicial complexes by finite spaces. I will also give some results on the relationship between subdivision of simplicial sets and of small categories (work of Rina Foygel), hoping that this will shed light on the role of second subdivision in Thomason's model structure on Cat.

Fernando Muro. *How far is a triangulated category from a model*

Triangulated categories were introduced in the 1960s by Puppe and Verdier in order to axiomatise the formal properties of the stable homotopy category and derived categories. They arise in nature as quotients or localizations of more complicated structures, called models, whose essence one tries to capture. Nowadays they are a fundamental tool in algebra, geometry, topology and mathematical physics, but nevertheless they are not yet well understood. One would like to know how much information is lost and how much is preserved when passing from the model to the associated triangulated category. There are puzzling results in this direction connected to K-theory. There cannot exist a reasonable K-theory for triangulated categories but one can still recover the K-theory of an abelian category out of its derived category. The discovery of triangulated categories without models adds even more confusion to the picture. In this talk we will try to shed some light by describing the first results we have obtained in a program to determine in a precise way what separates a triangulated category from a model.

Justin Noel. *Generalized cohomology and Generalized Witt Schemes*

The direct sum and tensor product operations on complex vector bundles make $H^*(BU)$ into a co-Hopf ring. We study this structure through its associated scheme $Spf(H^*(BU))$. This scheme is closely related to the scheme of Witt vectors. Replacing ordinary cohomology with an even-periodic cohomology theory E, we obtain an analogous relationship with a scheme of Witt vectors twisted by the formal group associated to E.

No knowledge of scheme theory is required.

Tim Porter. *Ordinal sum and Shuffles: reflexions on the pieces of a puzzle*

The sum of ordinals is a very simple operation yet seems basic to a lot of structure in Algebraic Topology. The talk will explore some of the constructions that have an interpretation in terms of ordinal sum. If there is time, it will also look at the possible links with Shuffles.

Some of the results are 'classical', other 'well known'. The 'puzzle' is to find the descriptions of the structure that explains the results, and hopefully extends them to non-Abelian homotopical situations.

Stratos Prassidis. *Detecting Linear Groups*

A discrete group which admits a faithful, finite dimensional, linear (real or complex) representation is called linear. In this talk, we give a linearity criterion that combines the natural structure of semi-direct products with work of A. Lubotzky.

In this way, we develop a technique to give sufficient conditions to show that a semi-direct product is linear. We will apply our criterion to check the linearity of certain classical groups. The talk is based on joint work with Fred Cohen, Marston Conder, and Jon Lopez.

Dale Rolfsen. *Orderable groups and applications to topology*

A group is left-orderable if there is a strict total ordering $<$ of its elements such that $g < h$ implies $fg < fh$ for all f, g, h in the group.

I will discuss certain groups that arise in topology, such as the braid groups and fundamental groups, and what the existence (or nonexistence) of orderings on these groups can reveal about the topology. For example, one can prove, using orderability, that certain 3-manifolds do not enjoy nice foliations. Another application is to the existence of maps of finite degree between certain manifolds.

Laura Scull. *Orbifolds and Equivariant Homotopy*

I will discuss a joint project with D. Pronk to create and exploit links between the theory of orbifolds and that of equivariant homotopy theory. I will describe a way to use translation groupoids to formalize the relation between these subjects, and how it can be used to translate equivariant homotopy invariants into orbifold invariants.

Volkmar Welker. *Combinatorics and Algebra of Subdivision Operations .*

For a simplicial complex Δ triangulating a topological X we describe several subdivision operations that have been studied in geometry. First we are interested in enumerative properties of the subdivision. We express its face numbers and the Hilbert-series of its Stanley-Reisner ring in terms of face numbers and Hilbert-series of Δ. The coefficient sequence of the numerator polynomial of the Hilbert-Series of a Stanley-Reisner ring is also called the h-vector of the simplicial complex. A complete classification of the h-vectors is known for boundary complexes of simplicial polytopes and conjectured for spheres. In the proof by Stanley of the necessity of the conditions from the classification the concept of a Lefschetz-Algebra appears. We explain this concept and a slight generalization. Then we show that several of the subdivisions operations when applied sufficiently often to "nice simplicial complexes" (e.g. Cohen-Macaulay simplicial complexes) will lead to a simplicial complex whose Stanley-Reisner ring is a Lefschetz algebra. Finally, we describe enumerative consequences.