Topology
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DROR BAR-NATAN, University of Toronto, Mathematics
Geography vs. Identity

Which is better, an emphasis on where things happen or on who are the participants? I can't tell; there are advantages and disadvantages either way. Yet much of quantum topology seems to be heavily and unfairly biased in favour of geography. See http://drorbn.net/t19.

PATRICIA CAHN, Smith College
Knot Invariants from Branched Covers of S^4

We consider dihedral branched covers of S^4, branched along an embedded surface with one non-locally flat point, modelled on the cone on a knot $K \subset S^3$. Kjuchukova proved that the signature of this cover is an invariant $\Xi_p(K)$ of the p-colorable knot K. We prove that the values of $\Xi_p(K)$ fall in a bounded range for ribbon knots, providing a means to test potential counter-examples to the Slice-Ribbon Conjecture. We also construct a family of (non-slice) knots for which the values of Ξ_p are unbounded. More generally, we introduce the notion of the dihedral 4-genus of a knot, and derive a lower bound on the dihedral 4-genus of K in terms of $\Xi_p(K)$. This work is joint with A. Kjuchukova.

VIRGINIE CHARETTE, Université de Sherbrooke
Crooked surfaces in the Einstein Universe

Crooked surfaces serve as building blocks (more accurately, building walls) for proper actions on the Einstein Universe, denoted Ein_3, which is the conformal compactification of Minkowski spacetime. There is an interesting interaction between Ein_3 and RP^3, via the linear symplectic structure on R^4. We will discuss joint work in progress with Jean-Philippe Burelle and Fanny Kassel.

DAN CHRISTENSEN, University of Western Ontario
No set of spaces detects isomorphisms in the homotopy category

Whitehead's theorem says that a map of pointed, connected CW complexes is a homotopy equivalence if and only if it induces an isomorphism on homotopy groups.

In the unpointed setting, one can ask whether there is a set $\mathcal{S}$ of spaces such that a map $f : X \to Y$ between connected CW complexes is a homotopy equivalence if and only if it induces bijections $[A, X] \to [A, Y]$ for all A in $\mathcal{S}$. Heller claimed that there is no such set $\mathcal{S}$, but his argument relied on an "obvious" statement about weak colimits in the homotopy category of spaces. We show that this obvious statement is false, thus reopening the question above. We then show that Heller was in fact correct that no such set $\mathcal{S}$ exists, using a different, more direct method.

ADAM CLAY, The University of Manitoba
Creating actions on the line from actions on the circle

For a given group G, this talk will explain how it is possible to use certain infinite families of orientation-preserving G-actions on S^1 to arrive at an orientation-preserving G-action on the real line. In the case where one knows that no orientation-preserving G-action on the real line exists, this technique yields infinite families of positive integers that encode the obstruction to such an action. While the most straightforward examples are amenable groups, I'll also discuss relevant examples in low-dimensional

topology, such as fundamental groups of 3-manifolds and certain mapping class groups. This is joint work with Ty Ghaswala and Jason Bell.

ROBIN GAUDREAU, University of Toronto
Concordance for framed and twisted virtual knots

For smooth knots in the 3-sphere, concordance has a purely geometrical definition as the equivalence generated by genus 0 cobordisms in the sphere times an interval. For virtual knots, the relation is extended by using diagram-based definitions. Both framed and twisted virtual knots have a rigidity imbued by a choice of unit normal vector field to the knot. This talk presents combinatorial definitions for concordance of framed and twisted virtual knots and slice obstructions coming from self-linking numbers.

TYRONE GHASWALA, University of Manitoba
Infinite-type surfaces and the arcs that survive

In the world of finite-type surfaces, one of the key tools to studying the mapping class group is to study its action on the curve graph. The curve graph is a combinatorial object intrinsic to the surface, and its appeal lies in the fact that it is infinite-diameter and δ-hyperbolic. For infinite-type surfaces, the curve graph disappointingly has diameter 2. However, all hope is not lost! In this talk I will introduce the surviving arc graph and we will see that for a large collection of infinite-type surfaces, the graph is infinite-diameter and δ-hyperbolic. The talk will feature a new characterization of infinite-type surfaces, which provided the impetus for this project.

This is joint work with Federica Fanoni and Alan McLeay

IAN HAMBLETON, McMaster University
Rank conditions for finite group actions on 4-manifolds

We will discuss restrictions on topological, locally linear actions of elementary abelian p-groups on 4-manifolds, including: (i) necessary and sufficient conditions for the collapse of the Borel spectral sequence for actions of cyclic groups of prime order, and (ii) upper bounds on the rank of finite groups acting homologically trivially with discrete singular set. [Joint work with Semra Pamuk, Middle Eastern Technical University, Ankara]

GABRIEL ISLAMBOULI, University of Waterloo
4-Manifolds and the Pants Complex

We show that every smooth, orientable, closed, compact 4-manifold can be represented by a loop in the pants complex. We use this representation, together with the fact that the pants complex is simply connected, to provide an elementary proof that such 4-manifolds are smoothly cobordant to connected sums of projective planes. This is joint work with Michael Klug.

RICK JARDINE, University of Western Ontario
Homotopy theories of diagrams

A pro-object in simplicial sets is a diagram $X : I \to s\mathbf{Set}$ with I right filtered. The pro-object X represents a functor $\hom(X, \ )$ with

$$\hom(X, Z) = \varinjlim_{i \in I} \hom(X(i), Z), \text{ for } Z \in s\mathbf{Set}.$$

A map $\phi : X \to Y$ of pro-objects is a map $\hom(Y, \ ) \to \hom(X, \ )$. There is a model structure (Edwards-Hastings) on this category for which a map ϕ is a weak equivalence if the map

$$\varinjlim_{j} \mathbf{hom}(Y(j), Z) \to \varinjlim_{i} \mathbf{hom}(X(i), Z)$$

(filtered colimits of function complexes) is a weak equivalence for all fibrant Z.

This talk describes a potential generalization of this structure to all small diagrams of simplicial sets, in a "pro-category" that is a Grothendieck construction: the objects are small diagrams $X : I \to s\mathbf{Set}$, and a morphism $\phi : X \to Y$ is a pair (α, f) consisting of a functor $\alpha : J \to I$ and a map of J-diagrams $f : X \cdot \alpha \to Y$, where $Y : J \to s\mathbf{Set}$ is another small diagram.

HOMAYUN KARIMI, McMaster University

The Jones-Krushkal polynomial and minimal diagrams of surface links

We prove a Kauffman-Murasugi-Thistlethwaite theorem for alternating links in thickened surfaces. It states that any reduced alternating diagram of a link in a thickened surface has minimal crossing number, and any two reduced alternating diagrams of the same link have the same writhe. This result is proved more generally for link diagrams that are adequate, and the proof involves a two-variable generalization of the Jones polynomial for surface links defined by Krushkal. The main result is used to establish the first and second Tait conjectures for links in thickened surfaces and for virtual links. This is joint work with Hans U. Boden.

CAGATAY KUTLUHAN, University at Buffalo

An invariant of contact structures in dimension 3 from open books

I will talk about joint work with Gordana Matic, Jeremy Van Horn-Morris, and AndyWand where we define a refinement of the Heegaard Floer contact invariant and how our invariant can be used to obstruct Stein fillability of contact 3-manifolds.

NINY ARCILA MAYA, University of British Columbia

Decomposition of Topological Azumaya Algebras

A topological Azumaya algebra of degree n over a CW-complex X is a bundle of complex algebras over X that is locally isomorphic to the matrix algebra $M_n(\mathbb{C})$. The tensor product of $\mathbb{C}$-algebras can be extended to topological Azumaya algebras by performing the operation fiberwise. We give conditions for positive integers m and n and the space X such that a topological Azumaya algebra of degree mn can be decomposed as the tensor product of Azumaya algebras of degrees m and n.

BILL MENASCO, University at Buffalo—SUNY

Origamis and coherently intersecting filling pairs of curves on a surface (preliminary report)

This work is joint with Xifeng Jin and Hong Chang. An *origami* is a closed oriented surface X which is obtained from a finite number of euclidean squares by glueing each right edge to a left one and each top edge to a bottom one. Mapping each of the squares onto a torus E in the obvious way one obtains a covering map $p : X \to E$ which is ramified at most in the vertices of the squares. The main object of study in this talk are origamis that can naturally be associated with a filling pair of simple closed curves, (α, β), in X that intersect coherently—their minimal intersection is equal to their algebraic intersection. We establish this association and go on to show the existence of a quasi-geodesic path in the complex of curves, $\alpha = a_0, a_1, a_2, \cdots, a_n = \beta$, such that a_i intersects a_{i+1} at exactly once. Moreover, any pair (a_i, a_j), $|i-j| \geq 3$ is a coherently intersecting filling pair and, thus, is associated with an origami.

MAGGIE MILLER, Princeton University

Concordance of light bulbs

Abstract: I use Dave Gabai's 4D light bulb theorem to prove an analogous statement in the setting of concordance: if two spheres R, R' in a 4-manifold X are homotopic and R admits a dual sphere, then R and R' are concordant (modulo a condition on 2-torsion in the fundamental group of X).

DOUG PARK, University of Waterloo
Geography of simply connected symplectic 4-manifolds

I will survey some recent results on the existence and uniqueness of closed simply connected smooth symplectic 4-dimensional manifolds. I will focus on the cases when the signature of the intersection form on the second homology group is nonnegative.

INA PETKOVA, Dartmouth College
Bordered Heegaard Floer homology over Z

Using nice diagrams, we provide an integral lift of bordered Heegaard Floer homology in the case of torus boundary. This is joint work with Douglas Knowles.

KATE POIRIER, City University of New York - New York City College of Technology
Fatgraphs for string topology and polytopes for V-infinity algebras

Spaces of fatgraphs have long been used to study a variety of topics in math and physics. In this talk, we introduce two spaces of fatgraphs arising in string topology—one which parameterizes operations on chains of the free loop space of a manifold and one which parametrizes operations on Hochschild cochains of a "V-infinity" algebra. We present a conjecture relating these two spaces to one another and to the moduli space of Riemann surfaces. We also introduce polyhedra called "assocoipahedra" which generalize Stasheff's associahedra to algebras with a compatible co-inner product. Assocoipahedra are used to prove that the dioperad governing V-infinity algebras is Koszul. This is joint work with Gabriel C. Drummond-Cole, Nathaniel Rounds, and Thomas Tradler.

KATHERINE RAOUX, Michigan State University
Knot Floer Homology and Relative Adjunction Inequalities

In this talk, we present a relative adjunction inequality for 4-manifolds with boundary. We begin by constructing generalized Heegaard Floer tau-invariants associated to a knot in a 3-manifold and a nontrivial Floer class. Given a 4-manifold with boundary, the invariant associated to a Floer class provides a lower bound for the genus of a properly embedded surface provided that the Floer class is in the image of the cobordism map induced by the 4-manifold. We will also discuss several applications to links and contact manifolds.

This is joint work with Matt Hedden.

WILL RUSHWORTH, McMaster University
Ascent concordance

Let Σ_g be a closed orientable surface of genus g, and $L_1 \hookrightarrow \Sigma_{g_1} \times I$ and $L_2 \hookrightarrow \Sigma_{g_2} \times I$ links in thickenings of Σ_{g_1} and Σ_{g_2}. A concordance between L_1 and L_2 is a pair (S, M), where M is a compact orientable 3-manifold with $\partial M = \Sigma_{g_1} \sqcup \Sigma_{g_2}$, and S a disjoint union of annuli properly embedded in $M \times I$ such that each annulus has a boundary component in both L_1 and L_2.

Given a concordance between L_1 and L_2, how complex need the 3-manifold M be? We show that there exist representatives of the same concordance class that are not concordant if one restricts to 3-manifolds that are Morse-theoretically simple. We exhibit one infinite family of such links that are detected by an elementary method, and another infinite family that require an augmented version of Khovanov homology to detect. These links provide counterexamples to an analogue of the Slice-Ribbon Conjecture.

ADAM SIKORA, SUNY Buffalo
Coordinates for webs in surfaces and their application to SL3-representations of surface groups and their quantization

(Joint work with Charles Frohman.) The space of SL(3)-representations of a surface F group can be described in terms of 3-valent oriented graphs in F (called webs) in a similar way as the space of SL(2)-representations of $\pi_1(F)$ is described in terms of multi-curves in F. In this talk, we construct coordinates for webs in punctured surfaces with ideal triangulations.

As an application of this result we show that the SL(3)-skein algebra of a surface, quantizing its SL(3)-character variety, is finitely generated.

LIAM WATSON, UBC

Mutation in Khovanov homology

Bloom and Wehrli have given proofs that Khovanov homology, with coefficients in the two-element field, is insensitive to mutation. I will describe some further progress on knot mutation in Khovanov homology. In particular, I will explain why Rasmussen's s-invariant (over any field) is insensitive to mutation (this is joint work with A Kotelskiy and C Zibrowius). On the other hand, I will describe how the presence of an involution can be used to refine Khovanov homology, resulting in an invariant that does detect mutation (this is joint work with A Lobb). The talk will assume little background and focus on examples.

BIJI WONG, Université du Québec à Montréal

Twisted Mazur Pattern Satellite Knots and Bordered Floer Theory

Bordered Floer theory has proven quite useful for studying satellites. In this talk, I'll discuss how to use gradings in bordered Floer theory to study the Floer thickness, 3-genus, and fiberedness of arbitrarily twisted Mazur pattern satellite knots. This is joint work with Ina Petkova.