ABSTRACTS OF TALKS, 2015 LEHIGH GEOMETRY/TOPOLOGY CONFERENCE

Nersés Aramyan [11:30-12:00 Saturday, NV III]. University of Illinois, Urbana-Champaign

The Integration Pairing and Extended Topological Field Theories.

Abstract: Given a complex line bundle with a connection on a manifold there is a straightforward way of producing 1-dimensional topological field theory over the manifold. One can generalize this procedure by replacing complex line bundles with n-gerbes bound by $\mathbb{C}^\times$, and replacing connections with appropriate connective structures. The resulting topological field theories are n-dimensional and extended. In this talk, we provide an explicit construction of topological field theories using the higher categorical framework of Jacob Lurie, and show that the construction establishes equivalence between the Deligne complex and the framed topological field theories.

Jonathan Beardsley [3:30-4:00, Saturday, NV III]. Johns Hopkins University

Hopf Galois Extensions in Infinity Categories with some examples.

Abstract: We construct a framework for working with bialgebras and their comodules in the infinity category of spectra. We define Hopf-Galois extensions in this setting and describe some heretofore unknown examples from chromatic homotopy theory.

Martin Bendersky [Friday, 1:30-2:30, NV I]. Hunter College

On the work of Don Davis.

Abstract: I will talk on the work of Don Davis. The lecture will be accessible to a general audience.

Yumi Boote [10:50-11:20 Sunday, NV III]. University of Manchester

Quaternionic projective space, $Pin(4)$, and the symmetric square.

Abstract: In this talk, I shall describe some beautiful geometry and topology associated to the symmetric square of quaternionic projective space, and calculate its integral cohomology ring. The classifying space of $Pin(4)$ plays an important role; its application to the geometry involves a symmetric orthogonalisation procedure, and its contribution to the algebra is via the associated Thom space. The method also works for the complex case, which will be discussed in detail in a forthcoming joint paper.

Gunnar Carlsson [12:10-1:10 Sunday, NV I]. Stanford University and Ayasdi Corp.

The topology of finite metric spaces.

Abstract: There is a lot of discussion (and hype) around the term "Big Data". It turns out that the size of the data isn't nearly as much of a problem as its complexity, and even small data sets can exhibit substantial complexity. Topology turns out to be a useful organizing principle for Big Data. I will discuss how this works, with numerous examples.

Wojciech Chacholski [10:50-11:20, Saturday, NV II]. KTH

Idempotent symmetries of groups and spaces.

Abstract: I plan to talk about certain aspects of the action of idempotent augmented functors on groups and spaces. One way to understand such an action is to try to describe its orbits, i.e., all idempotent deformations of a give group or a space. I will show for example that such an orbit of a finite and simple group can be enumerated by invariant subgroups of its second integral homology, and thus, according to the classification of finite simple groups, it can have at most 7 elements. I will also illustrate how some classical results in algebraic topology, for example the Serre's class theorem, relating homology and homotopy of nilpotent spaces, are consequences of idempotent symmetries of spaces. This will be then used to present a generalisation of a so called Bousfield Key lemma.

Li Chen [10:10-10:40 Saturday, NV III]. University of the District of Columbia

Digital Geometry and Digital Topology.

Abstract: Digital geometry mainly comes from two research areas: image processing and computer graphics. A digital image in $2D$ is in the form of digital grid points; it is a natural treatment of using geometry in image processing including segmentation, recognition, and reconstruction. On the other hand, computer graphics use geometric design, object dynamics, and modification. Digital geometry is also highly related to algorithmic geometry (computational geometry), which is more focused on algorithm design for discrete objects in Euclidean space. In this talk, we mainly focus on the digital method for geometric and topological computation. At the end of the talk, we will present the digital form of the Gauss-Bonnet theorem in $3D$: The genus $g = 1 + (M_5 + 2M_6 - M_3)/8$ where M_i indicates the set of surface-points each of which has i adjacent points on the surface. (Chen, Digital and Discrete Geometry, Springer, 2014.)

Lizhi Chen [NV I, Friday, 3:30-4:00]. Chern Institute, Nankai University

Systolic freedom of 3-manifolds.

Abstract: The systolic geometry investigates whether the volume of a Riemannian manifold M can be bounded below in terms of volumes of cycles representing nontrivial homotopy or homology classes. If such lower bounds do not exist, the manifold M is called with the property of systolic freedom.

For an n-dimensional manifold M with the Riemannian metric G, we define the norm of a homology class $\alpha \in H_k(M;\mathbb{Z})$ to be the infimum of volumes of all cycles representing α, denoted $\|\alpha\|_{\mathbb{Z}}$. Then we define the $\mathbb{Z}$-coefficient homology k-systole to be

$$\inf_{\alpha} \|\alpha\|_{\mathbb{Z}},$$

where the infimum is taken over all nonzero homology classes α in $H_k(M;\mathbb{Z})$, denoted Sys $H_k(M,\mathcal{G};\mathbb{Z})$. The $\mathbb{Z}_2$-coefficient homology k-systole, denoted Sys $H_k(M,\mathcal{G};\mathbb{Z}_2)$, is similarly defined to be the infimum of nonzero norms of all cycles representing homology classes in $H_k(M;\mathbb{Z}_2)$.

Now we know that the $\mathbb{Z}$-coefficient homology systolic freedom widely exists. However, we still do not know too much about the $\mathbb{Z}_2$-coefficient case. Freedman showed the first result of $\mathbb{Z}_2$-coefficient homology systolic freedom on $S^2 \times S^1$ in 1999. We use the technique of Freedman to show that the 3-manifold $\mathbb{RP}^3\#\mathbb{RP}^3$ is of $\mathbb{Z}_2$-coefficient homology $(1,2)$-systolic freedom. That is, we have

$$\inf_{\mathcal{G}} \frac{\mathrm{Vol}_{\mathcal{G}}(\mathbb{RP}^3\#\mathbb{RP}^3)}{\mathrm{Sys}\, H_1(\mathbb{RP}^3\#\mathbb{RP}^3,\mathcal{G};\mathbb{Z}_2)\cdot \mathrm{Sys}\, H_2(\mathbb{RP}^3\#\mathbb{RP}^3,\mathcal{G};\mathbb{Z}_2)} = 0,$$

where the infimum is taken over all Riemannian metrics $\mathcal{G}$ defined on $\mathbb{RP}^3\#\mathbb{RP}^3$.

Yuan-Jen Chiang [10:10-10:40 Saturday, NV I]. University of Mary Washington

Some Properties of Transversally f-biharmonic Maps.

Abstract: Transversally f-biharmonic maps are different from f-biharmonic maps, and they generalize the transversally biharmonic maps by Chiang and Wolak in 2008. We show that if the transversal f-tension field of a map ψ of foliated Riemannian manifolds is a transversal Jacobi field and ϕ is a transversally totally geodesic map, then the transversal f-tension field of the composition $\phi \circ \psi$ is a transversal Jacobi field. We also investigate the transversal stress f-bienergy of a map ψ of foliated Riemannian manifolds.

Michael Ching [NV II, Friday, 2:40-3:10]. Amherst College

Classification of Taylor towers for invariants of structured ring spectra.

Abstract: I will describe joint work with Greg Arone on the classification of Taylor towers in the sense of Goodwillie's calculus of functors. Then I will talk about how to apply this classification in the case of functors whose domain is a category of structured (e.g. E_n-) ring spectra. The goal is to describe the structure possessed by the sequence $\partial_* F$ of derivatives of a given functor. To illustrate the method I will describe joint work with Andrew Blumberg on the calculation of the structure on the derivatives of algebraic K-theory, considered as a functor from A_∞-ring spectra to spectra.

Daniel G. Davis [10:50-11:20 Sunday, NV II]. University of Louisiana

For the Ausoni-Rognes conjecture at $n = 1$, $p > 3$: a strongly convergent descent spectral sequence.

Abstract: Let p be a prime such that $p \geq 5$, let K be any closed subgroup of the units of the p-adics, and let $V(1)$ be the type 2 Smith-Toda complex $S^0/(p, v_1)$. Also, let KU_p denote the p-completed complex K-theory spectrum, with $K(KU_p)$ the associated algebraic K-theory spectrum. We discuss our proof that there is a strongly convergent descent spectral sequence

$$E_2^{s,t} = H_c^s(K; \pi_t(K(KU_p) \wedge V(1))[v_2^{-1}]) \Longrightarrow \pi_{t-s}((K(KU_p) \wedge v_2^{-1}V(1))^{hK}),$$

with $E_2^{s,t} = 0$, for all $s \geq 2$ and any $t \in \mathbb{Z}$. This spectral sequence can be viewed as giving a construction of a spectral sequence that is conjectured by Ausoni and Rognes. (The Ausoni-Rognes conjectures include statements for every $n \geq 1$, and our work addresses only part of the $n = 1$ case.)

Roberto De Leo [10:10-10:40 Sunday, NV III]. Howard University

Topology of planar sections of the skew polyhedron $\{4, 6|4\}$.

Abstract: The asymptotic behavior of open plane sections of triply periodic surfaces is dictated, for an open dense set of plane directions, by an integer second homology class of the 3-torus. The dependence of this homology class on the direction can have a rather rich structure, leading in special cases to a fractal. In this talk we present in detail the results for the skew polyhedron $\{4, 6|4\}$ and particular we show that in this case a fractal arises and that this fractal can be generated by a simple algorithm, which in turn allows us to verify for this case a conjecture of Novikov that such fractal has zero measure.

Philip Egger [2:40-3:10, Saturday, NV II]. Northwestern University

v_2 periodicity of A_1.

Abstract: Davis and Mahowald proved that the subalgebra $A(1) \subset A$ of the Steenrod algebra admits four different structures as an A-module and that all of these are the cohomologies of type 2 spectra we'll call A_1. We show that all of these spectra admit a v_2^{32} self-map. This work is joint with Bhattacharya and Mahowald.

Michael Farber [11:00-12:00 Friday, NV I]. Queen Mary University of London

Topology of large random spaces.

Abstract: I will discuss models producing large random simplicial complexes and topological properties of random spaces which hold with overwhelming probability. I will also discuss some open conjectures and possible applications.

Paul Goerss [9:00-10:00 Sunday, NV I]. Northwestern University

Algebraic and topological duality in stable homotopy theory.

Abstract: The chromatic view of stable homotopy theory assembles a finite spectrum from its $K(n)$-localizations, focusing our attention on the $K(n)$-local category. This category has a number of interrelated dualities, which together go under the name of Gross-Hopkins duality. This is particularly well-understood when $n = 1$ and $n = 2$, where there are both algebraic and topological manifestations which can be played against each other to force calculations that reveal elegant patterns.

Jesus Gonzalez [11:30-12:00 Saturday, NV II]. Cinvestav

Topological complexity of some polyhedral product spaces.

Abstract: Optimal planners are described for the sequential motion planning problem of robot arms where the number of simultaneously moving joins is limited by combinatorial restrictions.

John R. Harper [11:30-12:00 Sunday, NV II]. University of Rochester

An application of differentiable transformation groups to finite H-space theory.

Abstract: Theorems of Nomizu, Bochner and Montgomery are applied to show that H-parallelizable simply connected finite H-spaces are diffeomorphic to a product consisting of Lie groups and standard 7-spheres. The term H-parallelizable is introduced to mean that there is a smooth multiplication with a strict identity such that the left translates are diffeomorphisms. One consequence is that exotic 7-spheres are not H-parallelizable. The non-simply connected case is qualitatively different based on work of Tamar Friedmann concerning finite subgroups of simple Lie groups.

Kathryn Hess [4:10-5:10 Saturday, NV I]. École Polytechnique Fédérale de Lausanne

Delooping the space of long embeddings.

Abstract: (Joint work with Bill Dwyer.) I will explain how to prove that the space of long embeddings of $\mathbb{R}^m$ into $\mathbb{R}^n$ has the homotopy type of the $(m+1)$-fold loops on the derived mapping space of operad maps from the little m-disks operad to the little n-disks operad, whenever $n \geq m+3$. The proof works by induction on m, building on our earlier proof in the case $m = 1$, as well as on work of Arone and Turchin, identifying the space of long embeddings with a certain derived mapping space of so-called infinitesimal bimodules, and on a deep additivity theorem for E_n-operads, due to Fiedorowicz and Vogt.

Mike Hopkins [Saturday, 9:00-10:00, NV I]. Harvard University

TBA.

Rob Kusner [11:30-12:00 Saturday, NV I]. University of Massachusetts

Critical Configurations of Hard Disks on the 2-Sphere.

Abstract: We study the injectivity radius or thickness function r on the configuration space $C(k, S^2)$ of k distinct points on the 2-sphere. Criticality for maximizing r is equivalent to the existence of a balanced graph of geodesic arcs whose vertices are (a subset of) the points in the configuration (often, but not always, the remaining points are "rattlers"). We also develop a Morse Lemma for the second order behavior of r near such a critical configuration: $r = q + p + o(2)$ where q is a quadratic function on the tangent space of $C(k, S^2)$ and where p is piecewise linear and concave. For small values of k we can describe all the critical configurations and the corresponding Morse Complex, but we hope to understand some special values of k, like $k = 12$, where some surprises occur. (This is part of a joint project with W. Kusner, J. Lagarias and S. Shlosmann at ICERM this spring.)

MyIsmail Mamouni [NV III, Friday, 2:40-3:10]. CRMEF Rabat, Morocco

String topological robotics.

Abstract: Our main purpose in this talk is to marry two well know theories: String topology (founded by D. Sullivan and M. Chas in 1999) and topological robotics (founded by M. Farber some few years after, in 2003). We consider G a group and X a G-manifold of dimension n. We firstly define our main tool, the notion of *loop motion planning algorithm*. This yields to a homotopy invariant, the *loop topological complexity*, denoted here by $\mathrm{TC}^{\mathrm{LP}}(\mathrm{X})$, and interpreting the motion of a drone like an unmanned warplane or a guided TV camera. Our first main result states that $\mathrm{TC}(\mathrm{X}) = \mathrm{TC}^{\mathrm{LP}}(\mathrm{X})$. Secondly, we define on $\mathcal{M}^{\mathrm{LP}}(X)$ (the set of all loop motion planning algorithms on X) a boundary operator ∂ and equip it by a natural *loop motion product*. Our second main result states

that the loop motion product leads to a well defined *string loop motion product* which endows $\mathbb{H}_*(\mathcal{M}^{\mathrm{LP}}(X)) := H_{*+2n}(\mathcal{M}^{\mathrm{LP}}(X), \partial)$ with a structure of graded commutative and associative algebra.

John McCleary [3:30-4:00, Saturday, NV II]. Vassar College

Closed geodesics on manifolds that are elliptic spaces.

Abstract: Using the spectral sequence of Cohen, Jones, and Yan, Jones and I have computed sufficient parts of the string homology of certain manifolds to prove that they have infinitely many closed geodesics in any Riemannian metric. The ingredients in the proof include work of Felix, Halperin, and Thomas on (based) loop space homologies. Their notion of (mod p) elliptic spaces enjoy sufficient structure for our argument.

Frank Morgan [1:00-1:30 Saturday, NV II]. Williams College

Discussion session on future of the AMS Notices.

Abstract: As incoming Editor of the Notices of the American Mathematical Society, I'd like to hold a discussion session on its future.

Tom Needham [3:30-4:00, Saturday, NV I]. University of Georgia

Grassmannian coordinates on the space of framed curves.

Abstract: Curvature and torsion are real-valued functions that give isometry-invariant coordinates on the space of curves in R^3. This coordinate system comes with the cost that we can no longer easily tell whether a curve is closed. The problem of finding effective conditions on curvature and torsion that ensure that a curve closes is one of the oldest problems in elementary differential geometry.

In this talk we will describe an alternative isometry-invariant coordinate system that uses a pair of complex-valued functions to describe a space curve with an arbitrary framing. In these coordinates, the closure condition is simply L^2 orthogonality. This allows us to construct a Riemannian metric on the moduli space of closed framed curves in R^3, up to Euclidean similarity. In fact, the moduli space of framed curves is a Kahler manifold, which is isometric to an infinite-dimensional complex Grassmannian. The complex structure is related to the symplectic structure on the space of unparameterized loops, which was introduced by Marsden and Weinstein as a tool to study vortex filaments. The metric allows for computation of explicit geodesics and we will show how this is applied to give a shape recognition algorithm for protein backbones.

Priyanka Rajan [10:10-1:40 Sunday, NV I]. University of California, Riverside

Metrics of Almost Non-negative Curvature on certain Exotic RP^6's.

Abstract: We can put metrics of almost non-negative curvature on exotic $\mathbb{R}P^6$'s and $\mathbb{R}P^{14}$'s by lifting the positive curvature of quotient spaces under Davis Actions on Exotic 7-spheres and Exotic 15-Spheres to almost non-negative curvature on exotic $\mathbb{R}P^6$'s and $\mathbb{R}P^{14}$'s. This is an application of a recently proven lifting theorem by Searle and Wilhelm.

Doug Ravenel [Friday, 4:10-5:10, NV I]. University of Rochester

What is a G-spectrum?

Abstract: Algebraic topologists have been studying spectra and G-spectra for decades. The basic definitions have changed several times, yet our intuition about spectra has not. We have made extensive calculations with them from the very beginning. None of these have been affected in the least by the changing foundations of the subject.

This will be an instructional talk about a definition which has been in use for 15 years, with some indication of how it was used in the solution of the Kervaire invariant problem.

Tom Shimkus [10:10-10:40 Saturday, NV II]. U. Scranton

Towards necessity of Stong partitioning conditions.

Abstract: Stong's paper "Immersions of Real Flag Manifolds" (Proceedings of the AMS, 1983) was devoted to the proof that if a set of positive integers $\{n_1, ..., n_s\}$ satisfies certain partitioning conditions, then the top Stiefel-Whitney class of the normal bundle of the corresponding real flag manifold $F(n_1, ..., n_s)$ is nontrivial. Here $F(n_1, ..., n_s)$ is the real flag manifold of s-tuples of mutually orthogonal subspaces of $\mathbb{R}^{n_1+n_2+...+n_s}$, where each i^{th} coordinate of the s-tuples is an n_i-dimensional subspace. In "Grobner Bases and the Immersion of Real Flag Manifolds in Euclidean Space" (Mathematica Slovaca, 2001), Mirian Percia Mendes and Antonio Conde coined the phrase "Stong partition" to describe any set of positive integers that satisfied Stong's partitioning conditions. They then conjectured the converse of Stong's result, namely, if the top Stiefel-Whitney class of the normal bundle of $F(n_1, ..., n_s)$ is nontrivial, then $\{n_1, ..., n_s\}$ is a Stong partition. In this talk, I will prove an interesting related result: For $k = 1, 2, 3, ...$, in $\mathbb{Z}_2[x_{1,}x_2, ..., x_{2k}] \ / < \sigma_1, \sigma_2, ..., \sigma_{2k} >$, where $\sigma_1, \sigma_2, ..., \sigma_{2k}$ are the elementary symmetric polynomials in the variables $x_{1,}x_2, ..., x_{2k}$, the factorizations $\prod_{k \le i < j \le 2k} (x_i + x_j)$ always equal 0. It was proved by Stong and Hiller in "Immersion Dimension for Real Grassmannians" (Mathematische Annalen, 1981) that these factorizations equal $\sum_{f \in S_{k+1}} x_k^{f(k)} x_{k+1}^{f(k-1)} \cdots x_{2k}^{f(0)}$, where S_{k+1} is the set of permutations of $\{k, k-1, ..., 2, 1, 0\}$.

Justin Smith [10:10-1:40 Sunday, NV II]. Drexel University

Steenrod coalgebras.

Abstract: We show that a functorial version of the "higher diagonal" of a space used to compute Steenrod squares actually contains far more topological information — including (in some cases) the space's integral homotopy type.

Tulsi Srinivasan [3:30-4:00 Friday, NV II]. University of Florida

The Lusternik-Schnirelmann category of Peano continua.

Abstract: We extend the theory of the Lusternik-Schnirelmann category (LS-category) to Peano continua by means of covers by general subsets. We obtain upper bounds for the LS-category of Peano continua by proving analogues to the Grossman-Whitehead theorem and Dranishnikov's theorem, and obtain lower bounds in terms of cup-length, category weight and Bockstein maps. We use these results to calculate the LS-category for some fractal spaces like Menger spaces and Pontryagin surfaces. We compare this definition with Borsuk's shape theoretic LS-category. Although the two definitions do not agree in general, our techniques can be used to find similar upper and lower bounds on the shape theoretic LS-category, and we compute its value on some fractal spaces.

Jim Stasheff [2:40-3:10, Saturday, NV I]. UNC-CH and U Penn

The mathematics of higher spin particles.

Abstract: Problems of higher spin led in the 1980s to work of Berend, Burgers and van Dam using field dependent gauge symmetries which later was interpreted by Fulp, Lada and me as an L_∞-structure. Interest in this approach has recently revived in relation to deformation theory, 'derived' geometry and the Batalin-Vilkovisky formalism. This talk will be a survey intended to (re)introduce this topic to a wider audience.

Dennis Sullivan [1:30-2:30 Saturday, NV I]. Stony Brook University and City University of New York

Poincaré Duality and Projective Geometry.

Abstract: If M is an oriented closed smooth n-dimensional manifold, let A denote the differential forms and let $*$ denote the star operator for some metric on M with unit volume. It is remarkable that the two multiplications and the operator on forms: the wedge product, the conjugate of the wedge product by the star operator and $d*$ the conjugate of exterior d by the star operator only depend on the orientation and the smooth volume measure of the metric.

Thus this combined triple structure on A is an oriented diffeomorphism invariant of M. This follows from Moser's theorem that any two smooth probability measures on M with positive density are related by a diffeomorphism which is a deformation of the identity.

The proof, of this essential independence from the metric, is easy given the inspiration of the 80's paper of Koszul on what are now referred to as BV algebras. The proof goes by reinterpreting this triple structure on A as a triple structure on multivector [or polyvector] fields P on M. An isomorphism between P and A is effected by contracting polyvector fields with the volume form. Denote the exterior product on P by $\vee$ and still denote by $\wedge$ the product on P obtained by transferring to P the wedge product on A. The $\wedge$ product on P sends the degrees $[n-i, n-j]$ to degree $n-[i+j]$. This product is just the geometric intersection product of smooth currents. This makes sense because elements of P in degree k naturally give dual functionals on k-forms in the presence of any measure on M. If this measure is smooth, enough transversality holds to define the intersection of currents and one sees this intersection product is just $\wedge$.

The transfer of exterior d on A to an operator ∂ on P of degree minus one becomes the topologists boundary operator on smooth currents. The fact that ∂ is a derivation of $\wedge$ on P [which is clear by construction] is now also geometrically clear because the topological boundary of chains is a derivation for transversal intersections.

The new player added to this classical picture in topology is the $\vee$ product on P and one wonders: what does this product signify and how does $\vee$ interact with the topologically/geometrically interpreted structures $\wedge$ and ∂.

From Koszul's work one learns that ∂ is a second order derivation of $\vee$. This is easy to check in coordinates where the volume is flat. [Note the true equivalent statement from this presentation that $d*$ on A is a second order operator of wedge on forms cannot be checked this way because in general there are not coordinates where the metric is flat.]

The next issue is the algebraic interplay of $\vee$ and $\wedge$. Since differentiation is no longer involved this purely algebraic question may be reduced to the exterior algebra on the tangent space at a single point. Recall this exterior algebra is endowed with a choice of volume in the top degree. Such a structure is called a Peano space by Gian Carlo Rota who has been quoted as declaring "The neglect of the exterior algebra is perhaps the greatest mathematical tragedy of the twentieth century." We take note of this for our questions.

In any case Rota observes that for a Peano space such as ours the products $\vee$ and $\wedge$ are the algebraizations of the two operations on pure tensors from projective geometry called "meet" and "join".

Pure tensors correspond to linear subspaces of the tangent space and thus to linear projective subspaces of the projective space of the tangent space.

"Meet" which is denoted $\wedge$ is the TRANSVERSAL intersection of linear subspaces of projective space while "join" which is denoted $\vee$ is the projective join of two DISJOINT linear subspaces of projective space. These two operations are interchanged by projective duality. We will use this even more classical projective geometry picture to discuss the prop PD which describes our Poincaré Duality structure [meet, join and boundary] by taking note in this century of that aspect of the exterior algebra which Rota firmly believed was neglected in the last century.

Ron Umble [10:50-11:20, Saturday, NV III]. Millersville University of PA

Biassociahedra revisited.

Abstract: We construct the *biassociahedron* $KK_{n,m}$ as the *framed combinatorial join* of the associahedra K_m and K_n. Biassociahedra are contractible polytopes that encode the defining relations of an A_∞-bialgebra just as associahedra encode the defining relations of an A_∞-algebra. Our construction views $KK_{n,m}$ as a quotient of a related contractible polytope $PP_{n,m}$, which is a subdivision of the permutahedron P_{n+m-2}. To construct $PP_{n,m}$, we insert *subdivision vertices* into the edges of P_{n+m-2} and subsequently subdivide the higher dimensional cells. The construction presented here corrects an error in our original construction of $KK_{n,m}$, which appears in our paper "Matrads, Biassociahedra, and A_∞-bialgebras," HHA 13(1) (2011), 1-57. When $m, n \geq 4$, our corrected construction inserts fewer subdivision vertices into P_{n+m-2}.

Marco Varisco [11:30-12:00 Sunday, NV III]. University at Albany, SUNY

Algebraic K-theory of group rings and the cyclotomic trace map.

Abstract: In joint work with Wolfgang Lück, Holger Reich, and John Rognes http://www.arxiv.org/abs/1504.03674, we prove that the Farrell-Jones assembly map for connective algebraic K-theory is rationally injective, under mild homological finiteness conditions on the group and assuming that a weak version of the Leopoldt-Schneider conjecture holds for cyclotomic fields. This generalizes a result of Bökstedt, Hsiang, and Madsen, and leads to a concrete description of a large direct summand of $K_n(\mathbb{Z}[G]) \otimes_{\mathbb{Z}} \mathbb{Q}$ in terms of group homology. In many cases the number theoretic conjectures are true, so we obtain rational injectivity results about assembly maps, in particular for Whitehead groups, under finiteness assumptions on the group only. The proof uses the cyclotomic trace map to topological cyclic homology, Bökstedt-Hsiang-Madsen's functor C, and new general injectivity results about the assembly maps for topological Hochschild homology and C.

David White [3:30-4:00 Friday, NV III]. Denison University

Baez-Dolan Stabilization and the Importance of Left Properness.

Abstract: We will begin with an overview of an old problem, due to Baez and Dolan, and discuss how to solve this problem for weak n-categories. This requires us to place left proper model structures on algebras over certain colored operads. Our path will take us through a discussion of model structures on categories of commutative monoids and on the category of (not necessarily reduced) symmetric operads.

Peng Wu [10:50-11:20, Saturday, NV I]. Cornell University

A Weitzenbock formula for canonical metrics on four-manifolds and applications.

Abstract: The Weitzenbock formula and curvature decompositions play the key role in the classification of Einstein four-manifolds with positive curvature. In this talk we will first provide a new proof of the Weitzenbock formula for Einstein metrics, and then establish a unified framework for the Weitzenbock formula for a large class of canonical metrics on four-manifolds, which are called generalized m-quasi-Einstein metrics (or "Einstein metrics" for smooth metric measure spaces, including for example gradient Ricci soliton, quasi-Einstein metrics, and conformally Einstein metrics). As application we prove several rigidity theorems for four-dimensional Einstein manifolds, conformally Einstein manifolds, and gradient shrinking Ricci solitons.

Dmytro Yeroshkin [11:30-12:00 Sunday, NV I]. Syracuse University

On Poincaré Duality for Orbifolds.

Abstract: This talk will examine the obstructions to integer-valued Poincaré duality for (underlying spaces of) orbifolds. In particular, it will be shown that in dimensions 4 and 5, the obstruction is controlled by the orbifold fundamental group. A consequence of this is that if the orbifold fundamental group is naturally isomorphic to the fundamental group of the underlying space, then the orbifold satisfies integer-valued Poincaré duality.