Submittee: Steven Bleiler
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Title: Cascade Topology Seminar
Event Type: Conference-Workshop

Location:
Portland State University, Portland, Oregon USA

Dates:
May 18-19, 2013

Topic:
Algebraic and Geometric Topology, Algebraic K-Theory

Methodology:
Lectures and collaborative discussions

Objectives Achieved:
One of the major goals of the Cascade Topology Seminar is to promote the interaction between the region's thinly spread topologists and their students. In this the 50th Cascade was particularly successful. The Cascade Topology Seminar was started in the early 90s by Steven Bleiler (Portland State Univ.), Douglas Ravanel (Univ. of Washington), and Dale Rolfsen (Univ. of British Columbia). It has continued since that time as a very successful biannual topology meeting for the Pacific Northwest re- gion, although the original geographic terminology representing the Cascade Mountains of Oregon, Washington, and British Columbia has been broadened to include meetings in California, Nevada, Idaho, and Alberta. The CTS has also been run under the auspices of PIMS for the past ten years or so. All three of the original founders of the CTS attended and one Douglas Ravenell, now of the University of Rochester, opened the meeting with a talk on his contribution to the solution of the Arf-Kervaire invariant problem.

Scientific Highlights:
Each of the seven talks represented significant progress in various areas of algebraic and geometric topology along with algebraic K-theory, ranging from knot and three manifold theory, to Andre-Quillen homology theory, and to the solution to the Arf-Kervaire invariant problem.

Organizers:
Bleiler, Steven, Fariborz Maseeh Department of Mathematics and Statistics, Portland State University served as local organizer for this meeting. The Cascade as a whole is organized by Alejandro Aden, University of British Columbia, Kristine Bauer, University of Calgary, Steve Bleiler, Portland State, Ryan Budney, University of Victoria, Christine Escher, Oregon State University, Uwe

Kaiser, Boise State University, John Palmieri, University of Washinton, and Hal Sadofsky University of Oregon

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Speakers:
Douglas C. Ravenel, University of Rochester A solution to the Arf-Kervaire invariant problem Abstract: The Arf-Kervaire invariant problem arose from Kervaire-Milnor's classification of exotic spheres in the early 1960s. Browder's theorem of 1969 raised the stakes by connecting it with a deep question in stable homotopy theory. In 2009 Mike Hill, Mike Hopkins and I proved a theorem that solves all but one case of it. The talk will outline the history and background of the problem and give a brief idea of how we solved it.// Kate Poirier, University of California, Berkeley Intersecting loops on surfaces, string topology, and the moduli space of Riemann surfaces Abstract: String topology is the study of algebraic structures arising from intersecting loops in manifolds. These structures encode interesting topological and geometrical information about the manifold itself. One example of a string topology operation is the Goldman bracket, which is given by intersecting loops on surfaces. In this talk, I will define the Goldman bracket for surfaces, introduce generalizations of it to string topology operations for manifolds of higher dimension, and describe how a compactification of the moduli space of Riemann surfaces parametrizes these operations. This includes joint work with Grabriel C. Drummond-Cole and Nathaneil Rounds.// Allen Hatcher, Cornell University Homology of Moduli Spaces of Graphs Abstract: This talk will describe what is known about an analog for finite graphs of the Riemann moduli space of hyperbolic structures on a surface. The main focus to date has been on computations of the rational homology of this moduli space of graphs, which is the same as the rational homology of the automorphism group of a free group. This homology is known to stabilize as the rank of the free group increases, and Galatius showed that the stable rational homology is trivial. This is not true unstably, however, as several rational homology groups outside the stable range are known to be nontrivial. As with the Riemann moduli space, it seems to be difficult and intriguing problem to get a good picture of the unstable homology. There are general methods for constructing cycles, but the patterns for when these bound are still obscure.// Kristine Bauer, University of Calgary Calculus and applications: Andre-Quillen homology Abstract: Andre-Quillen homology for commutative rings was described by Quillen as the "correct" homology for these rings. We consider the Andr\'e-Quillen homology of a commutative k-algebra R which is augmented over a ring A. Kantorovitz-McCarthy and Schwede independently showed that the Andr\'e-Quillen homology is related to derivative of the augmentation ideal functor from commutative augmented A-algebras to A-modules. In doing so, they used a version of functor calculus due to Johnson-McCarthy which was intended to be more "algebraic" or "discrete" than Goodwillie's original calculus of functors. The theory at the time would only apply to functors from categories which had a basepoint. This kind of calculus was deficient in its need for a basepoint: Goodwillie's original theory did not require a basepoint, and to recover Andre-Quillen homology as an example of calculus a basepoint needed to be added. More recently, Johnson-McCarthy and I have extended the algebraic version of calculus to functors which do not require a basepoint. In this talk, we'll examine potential examples of this type of "unbased" calculus, including the potential of Andre-Quillen homology to be one of these examples. This work is related to a project by a group of young women topologists led by myself, Maria Basterra and Brenda Johnson at the upcoming WIT (Women in Topology) workshop at the Banff International Research Station. This is a workshop designed to encourage women in homotopy theory to continue in the field. Unlike many other meetings designed to encourage women in mathematics, the goal of this workshop is that every participant will be a joint author on a peer-reviewed article at the end of the workshop.// Martin Scharlemann, University of California, Santa Barbara Generating the genus g+1 Goeritz group of a genus g handlebody Abstract: A specific set of 4g+1 elements is shown to generate the Goeritz group of the genus g+1 Heegaard splitting of a genus g handlebody. These generators are consistent with Powell's proposed generating set for the Goeritz group of the genus g+1 splitting of the 3-sphre. There are two proofs: one using purely classical techniques and one using thin

position. I hope to be able to at least sketch both proofs.// Alejandro Adem, University of British Columbia and PIMS Topology of spaces of representations for abelian groups Abstract: In this talk we describe recent work on the homotopy and equivariant K-theory with respect to conjugation for spaces of commuting elements in a compact Lie group. This is joint work with Fred Cohen and JosÃ© Manuel GÃ³mez.// Abigail Thompson, University of California, Davis Generalized width for knots in the 3-sphere Abstract: This is joint work with Joel Hass and J. Hyam Rubinstein. A knot K in the 3-sphere is in thin position if it is positioned efficiently with respect to a foliation of the 3-sphere minus 2 points by 2-speres. We generalize this to multiple-parameter families of 2-spheres (or planes, whichever is handy), and show that the generalizations enjoy some useful properties. In particular we show that the generalization to a 2-parameter family yields a proper knot invariant, and ask whether the same is true for higher parameters.// Louis H Kauffman, University of Illinois, Chicago Virtual Knot Theory and the Affine Index Polynomial Abstract: This talk describes a polynomial invariant of virtual knots that is defined in terms of an integer labeling of the virtual knot diagram. This labeling is seen to derive from an essentially unique structure of affine flat biquandle for flat virtual diagrams. The invariant is discussed with many examples. We compare the information in this invariant with that obtained from the Jones polynomial and show how it can be used to detect many virtual knots that have unit Jones polynomial. Virtual knot theory is the study of knots in thickened surfaces taken up to stabilization via the addition or cancellation of 1-handles in the knot complement. There is a diagrammatic theory of virtual knots that makes possible the definition of many new invariants and the examination of curious and interesting topological phenomena.

Links:
http://www.pdx.edu/math/cts-2013-meeting // http://www.pims.math.ca/scientific-event/120428-cts

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