Commutative Algebra: Connections with Algebraic Topology and Representation Theory
May 18-22, 2008
University of Nebraska-Lincoln

Talk Abstracts

Speaker: **Dave Benson**
Title: *Squeezed resolutions and the loop space on BG p-completed*

Abstract: Let G be a finite group and k be a field of characteristic p. I shall explain how to form squeezed resolutions over kG, and how this computes the homology of the loop space on the p-completion of BG. I shall discuss polynomial versus exponential growth rate of the homology, which will lead in to the talk of Greenlees.

Speaker: **Petter Andreas Bergh**
Title: *Quantum complete intersections*

Abstract: Quantum complete intersections are finite dimensional "almost commutative" algebras. This class of algebras contains the exterior algebras and finite dimensional commutative complete intersections. In this talk, we look at homological properties of these algebras, in particular properties which characterize the commutative complete intersections.

Speaker: **Alex Berglund**
Title: *Minimal Koszul models in local algebra and rational homotopy theory*

Speaker: **Winfried Bruns**
Title: *Koszul homology and the N_p property of Veronese subrings*

We discuss a simple proof of Green's bound for the vanishing of Koszul homology of the powers of the irrelevant maximal ideal of a polynomial ring over a field.

The bound is applied to Veronese subrings of graded Cohen-Macaulay algebras R that are only assumed to have a Noether normalization in degree 1. This leads to a bound for their N_p property in terms of the regularity of R. This result is motivated by a corresponding theorem in toric geometry proved by Hering, Schenck and Smith.

An important aspect of the talk is the Avramov-Golod theorem on the Poincare algebra structure of the Koszul homology.

The talk is based on ongoing joint work with Aldo Conca and Tim Römer.

Speaker: **Ragnar-Olaf Buchweitz**
Title: *On the Endomorphismring of the Syzygies in the tautological Koszul Complex* (jt. work with Thuy Thu Pham)

Abstract: Recent work on noncommutative desingularisations of determinantal varieties led us to take a closer look at the object in the title. While its linear properties, such as local cohomology and projective resolution, are well within reach of a first course in commutative algebra --- and provide interesting examples ---the multiplicative properties are more intriguing.

Based on results by T.Bridgeland, we show that the n-th Veronese subalgebra, if n is the number of variables, is Koszul, Calabi-Yau, of finite global dimension, and provides an algebraic model of the anti-canonical bundle of the underlying projective space, realising that bundle as a moduli space of representations of that algebra.

We will indicate how these results relate to the theory of quiver representations and helices.

Speaker: **Jon Carlson**
Title: *Finite generation of Tate cohomology*

Speaker: **David Eisenbud**
Title: *Cones of Betti Tables and Cohomology Tables*

Abstract: In 2006 Boij and Soederberg made a series of remarkable conjectures, purporting to describe, up to scalar multiple, exactly which tables of numbers can be Betti tables of Cohen-Macaulay graded modules over polynomial rings. The motivation was to prove the Multiplicity Conjectures of Herzog, Huneke, Srinivasan and Zheng.

These conjectures have now been proved, along with various extensions. I'll describe the picture they give, and talk about the proofs. The work has been done by various combinations of Boij, Soederberg, Floeystad, Weyman, Schreyer and myself.

Speaker: **John Greenlees**
Title: *Homotopy invariant notions of complete intersections for commutative rings and ring spectra.*

(Joint with Dave Benson)

Abstract: I will describe a homotopy invariant characterization of a complete intersection which builds on work with Dwyer and Iyengar. This then allows one to discuss when the (E infinity) cochains on a space X is a complete intersection. We are particularly interested in the case of the classifying space of a finite group at a prime p, and in analogues of Gulliksen's theorem (which here relates the property of being a complete intersection with the growth rate of the loop space homology). I hope to discuss some examples of hypersurfaces, and relate them to Benson's work on loop space homology of finite groups, as described in his talk.

Speaker: **Steve Halperin**
Title: *An Asymptotic Formula for the Ranks of the Homotopy Groups of a 1-connected Finite Complex, and for the Deviations of a Local Ring*

Speaker: **Jürgen Herzog**
Title: *Vertex Cover Algebras*

Speaker: **Mel Hochster**
Title: *Tight Closure and Localization*

Abstract: Brenner and Monsky have recently shown that tight closure does not, in general, commute with localization, and that tight closure is different from plus closure. The talk will discuss the effect of this result on the theory as a whole, as well as the open questions that remain:

1) Does tight closure commute with localization at one element?

2) Is tight closure the same as plus closure in affine algebras over a finite field?

3) Does the property that every ideal is tightly closed pass to localizations?

4) Is there a variant definition that would yield a notion that does commute with localization?

The third question is connected with the behavior of tight closure in Artinian modules, and I will discuss some recent work in this direction.

Speaker: **Kathryn Hess**
Title: *Power maps on the Hochschild complex of a twisting cochain*

Speaker: **Henrik Holm**
Title: *Vanishing of cohomology over AC rings.*

Abstract: This talk is a report on joint work with Lars Winther Christensen. Auslander conjectured that every Artin algebra satisfies a certain condition (AC) on vanishing of cohomology of finitely generated modules. The conjecture was disproved in 2003 by a counterexample due to Jorgensen and Sega. In this talk we address a number of relations between the AC property and other homological conjectures for rings.

Speaker: **Craig Huneke**
Title: *Comparing powers and symbolic powers of ideals*

Speaker: **Kiriko Kato**
Title: *Recollement of homotopy categories and Cohen-Macaulay modules*

Speaker: **Henning Krause**
Title: *Localizing subcategories of the stable module category of a finite group*

Abstract: Following the theme of the conference, this talk discusses some interesting interplay between commutative algebra and representation theory of finite groups. Using support varieties as introduced by Benson, Carlson and Rickard, one can show that the localizing subcategories of the stable module category of a finite group G are parametrized by sets of non-maximal homogeneous prime ideals of the cohomology ring of G. The proof is based on a number of reductions so that methods and results from commutative differential graded algebra can be applied. I will also report on some consequences of this classification. All these results are based on joint work with Dave Benson and Srikanth Iyengar.

Speaker: **Joseph Lipman**
Title: *Hochschild homology and Grothendieck Duality*

Speaker: **Claudia Miller**
Title: *On the Frobenius Endomorphism*

Speaker: **Izuru Mori** （Shizuoka University）
Title： *Symmetry and Asymmetry of the Euler form*

Abstract：Let R be a noetherian ring over a field k, and M, N finitely generated right R-modules. In general, $Ext^i_R(M,N)$ and $Ext^i_R(N, M)$ are very different. However, surprisingly, in some reasonably nice situations, the Euler forms $\xi(M, N)$ (defined as an alternating sum of k-vector space dimension of $Ext^i_R(M, N)$'s) and $\xi(N, M)$ are equal
up to sign as long as both are well-defined. In this talk, we will discuss some sufficient conditions on R so that, for all M, N, $\xi(M, N)$ are well-defined if and only if $\xi(N, M)$ are well-defined. We will also construct some counter-examples to the above symmetry property on
Ext-groups.

Speaker: **Irena Peeva**
Title: *Hilbert schemes over Clements-Lindstrom rings*

Speaker: **Greg Piepmeyer**
Title: *TBA*

Speaker: **Tony Puthenpurakal**
Title: Asymptotic stabilization of prime divisors of certain extension modules

Abstract: Let Q be a Noetherian ring with finite Krull dimension and let $f_1,..,f_c$ be a regular sequence in Q. Set $A = Q/(f_1,....,f_c)$. Let I an ideal in A and let M,N be finitely generated A-modules with M of finite projective dimension. We show that the set

$$U_{i,n} \, Ass_A \, Ext^i_A(M,I^nN)\}$$

is finite. We also show that there exists integers i_0, n_0 such that for all $i > i_0$ and $n > n_0$ we have equalities

$$Ass \; Ext^{2i}_{A}(M,I^nN) = Ass \; Ext^{2i_0}_{A}(M,I^{n_0}N)$$

$$Ass \; Ext^{2i+1}_{A}(M,I^nN) = Ass \; Ext^{2i_0 +1}_{A}(M,I^{n_0}N)$$

Speaker: **Idun Reiten**
Title: Cluster tilting and hypersurfaces

Speaker: **Paul Roberts**
Title: Almost Cohen-Macaulay Algebras

One of the classical topics in Commutative Algebra is the study of Cohen-Macaulay rings and algebras. In addition to their intrinsic interest, they have important applications to other questions, such as the Homological Conjectures. A few years ago Heitmann showed that a weaker condition, which we call the property of being almost Cohen-Macaulay, has many of the same implications and is much more likely to hold. In this talk I will define almost Cohen-Macaulay rings, give several examples, and discuss some of the implications of their existence. I will also describe a new approach to the question of their existence for rings of mixed characteristic.

Speaker: **Jan-Erik Roos**
Title: Homological properties of the cohomology ring of the fundamental group of 3-manifolds

Abstract: I will start with a short historical introduction about the
connections between the homological theory of commutative local rings and
the homotopy theory of simply connected CW-complexes. Then I will turn to
the non-simply connected case and describe some new results in this area.
This is related both to hyperplane arrangements
(cf. my recent paper in Experimental Mathematics vol. 17, issue 2, pages
129-143 (2008)), and to the case described by the title of my talk.

Speaker: **Sean Sather-Wagstaff**
Title: Counting semidualizing complexes

Abstract: Semidualizing complexes arise naturally in the study of dualities over local rings. We will discuss progress on the problem of counting the semidualizing complexes over a given local ring.

Speaker: **Mufit Sezer**
Title: Separating Invariants

Speaker: **Brooke Shipley**
Title: A curious example of two model categories and some associated differential graded algebras.

Speaker: **Janet Striuli**
Title: Degree of generalized Hilbert Polynomials and applications

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Speaker: **Bernd Ulrich**
Title: Blowup algebras and fibers of morphisms

Speaker: **Clarence Wilkerson**
Title: The rational homotopy of toric varieties