Mini-Workshop on Algebras and Representations

(May 7, 2011, Beijing Normal University)

PROGRAM

09:30-10:30	**Hideto Asashiba** (*Shizuoka University, Shizuoka*)
10:30-11:00	Tea Break
11:00-12:00	**Yang Han** (*Chinese Academy of Sciences, Beijing*)
12:00-14:00	Lunch Break
14:00-15:00	**Ming Fang** (*Chinese Academy of Sciences, Beijing*)
15:10-16:10	**Hongxing Chen** (*Beijing Normal University, Beijing*)
16:10-16:40	Tea Break
16:40-17:40	**Yu Ye** (*University of Science and Technology of China, Hefei*)

All lectures will take place at Hou Zhu Building (后主楼), Room 1124.

TITLES AND ABSTRACTS

Hideto Asashiba: *Grothendieck constructions and derived equivalences of oplax functors from a small category to the 2-category of k-categories*

We fix a commutative ring k and a small category I, and denote by $k\text{-Cat}$ the 2-category of k-categories. As a generalization of a group action on a k-category, we consider a functor $X : I \to k\text{-Cat}$ (when I is a group regarded as a category with a single object $*$, this is just a group action on $X(*)$). More generally we consider (op)lax functors as explained in III below[1], even for which Grothendieck constructed a category $\mathrm{Gr}(X)$ (it coincides with the orbit category $X(*)/I$ when I is a group). A fundamental tool for the derived equivalence classification of representation-finite self-injective algebras was the following:

Theorem I. Assume that I is a group and let C, C' be k-categories with I-actions. If there is an I-stable tilting subcategory T for C such that T and C' are I-equivariantly equivalent, then the orbit categories C/I and C'/I are derived equivalent. We generalize this to any small category I (not necessarily a group) and to any oplax functor (not necessarily a functor) to show the following:

Theorem 1. Let X and X' be oplax functors $I \to k\text{-Cat}$. If there exists a "tilting oplax subfunctor" T for X such that T and X' are equivalent in the 2-category $\mathrm{Oplax}(I, k\text{-Cat})$ (see III below), then $\mathrm{Gr}(X)$ and $\mathrm{Gr}(X')$ are

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[1] Professor Hideto Asashiba will give another two talks at BNU algebra seminar before this mini-workshop. For more details, see http://math.bnu.edu.cn/~ccxi/index.html.

derived equivalent.

(The assumption above is just the condition (2) in III.) This gives a way how to produce a derived equivalence between categories C and C' of the form $C = \mathrm{Gr}(X)$, $C' = \mathrm{Gr}(X')$ for some oplax functor X, X' from derived equivalences between their pieces $X(i)$ and $X'(i)$ ($i \in I$) by gluing them together. As a trivial application, this gives a unified proof of the fact that if A and A' are derived equivalent k-algebras, then so are their quiver algebras AQ, $A'Q$, incidence algebras AS, $A'S$ and semigroup algebras AG, $A'G$ for all quivers Q, posets S and semigroups G.

Hongxing Chen: *Recollement Theory for Good Tilting Modules*

My talk is on joint work with my supervisor Professor Changchang Xi. We shall establish a recollement theory for the derived categories of the endomorphism rings of good tilting modules over arbitrary associative rings, and further study different stratifications of these derived categories. It turns out that our new construction of recollements shows that the Jordan-Hölder theorem fails even for stratifications of derived module categories by derived module categories.

Ming Fang: *Endomorphism algebras of generators over symmetric algebras, dominant dimension and Hochschild cohomology*

In this talk, I will present my joint work with Steffen König on characterizing the endomorphism algebras of generators over symmetric algebras and particularly their dominant dimensions. As an application, we compare the Hochschild cohomology of symmetric algebras with that of the endomorphism algebras.

Yang Han: *Perfect recollements of derived categories of algebras*

Perfect recollements of derived categories of algebras are introduced. Almost all known recollements of derived categories of algebras are perfect. From a perfect recollement of derived categories of algebras, we can construct perfect recollements of derived categories of tensor product algebras and opposite algebras respectively. These results are applied to show that, in a perfect recollement of derived categories of algebras, the middle algebra is smooth if and only if so are the algebras on both sides. As a corollary, a triangular matrix algebra is smooth if and only if so are the algebras on diagonal. Moreover, all triangulated functors in perfect recollements of derived categories of algebras and tensor product algebras are realized as derived functors of the same forms. As applications, we can also obtain the long exact sequence on the Hochschild homologies of algebras in a perfect recollement of derived categories of algebras due to Keller, and the comparison theorem on relative Hochschild homologies and relative cyclic homologies after dropping projective modules due to Igusa and Zacharia.

Yu Ye: *A Galois-like theory for pointed coalgebra extensions*

In this talk I will introduce a Galois-like theory for pointed coalgebra extensions. We show that for an acyclic quiver Q, there exists a bijective correspondence between large subcoalgebras of the path coalgebra kQ^c and certain class of subgroups of the automorphism group of kQ^c.

REGISTRATION

There is no formal registration. Please send a short message (before May 4) to **Yuming Liu** by email ymliu@bnu.edu.cn if you intend to participate.

ALL ARE WELCOME!

Algebra Group at BNU

April 21, 2011