Shanghai Workshop on Representation Theory

(December 11 $\sim$ 12, 2010)

PLACE: **December 11th**
Department of Mathematics
East China Normal University

December 12th
Department of Mathematics
Tongji University

December 11th (Sat)

9:00 - 9:50	Jiao Zhang (East China Normal Univ.) Cyclic Homology of Strong Smash Product Algebras
10:00 - 10:50	Guanlian Zhang (Shanghai Jiaotong Univ.) Canonical bases, perverse sheaves and Ringel-Hall algebras
11:00 - 11:50	Osamu Iyama (Nagoya Univ.) Stable categories of Cohen-Macaulay modules and Cluster categories
13:30 - 14:00	Zhongguo Zhou (Hohai Univ.) Irreducible Characters for Algebraic Groups in Characteristic Three
14:10 - 15:00	Jianyi Shi (East China Normal Univ.) On a conjecture of Lusztig for the function a.
15:30 - 16:20	Susumu Ariki (Osaka Univ.) Positivity of certain polynomials and relative decomposition matrices
16:30 - 17:20	Etsuro Date (Osaka Univ.) On quotients of the Onsager algebra

December 12th (Sun)

9:00 - 9:50	Qiang Fu (Tongji Univ.) Quantum affine $\mathfrak{gl}_n$ and affine q-Schur algebras
10:00 - 10:50	Kentaro Wada (RIMS, Kyoto Univ.) Induction and Restriction functors for cyclotomic q-Schur algebras
11:00 - 11:50	Toshiaki Shoji (Nagoya Univ.) Character sheaves associated to the enhanced nilpotent cone

13:30 - 14:00	Xiaoqing Yue (Tongji Univ.) Filtered Lie conformal algebras whose associated graded algebras are isomorphic to that of general conformal algebra gc_1
14:10 - 15:00	Mei Si (Shanghai Jiaotong Univ.) Non-vanishing Gram determinants for cyclotomic Nazarov-Wenzl and Birman-Murakami-Wenzl algebras
15:30 - 16:20	Ken-ichi Shinoda (Sophia Univ.) Gauss sums on finite groups
16:30 - 17:20	Hyohe Miyachi (Nagoya Univ.) Hidden Hecke algebras and duality

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Abstracts

Jiao Zhang (East China Normal Univ.)

Cyclic Homology of Strong Smash Product Algebras

For any strong smash product algebra $A\#_R B$ of two algebras A and B with a bijective morphism R mapping from $B \otimes A$ to $A \otimes B$, we construct a cylindrical module $A\natural B$ whose diagonal cyclic module $\Delta_\bullet(A\natural B)$ is graphically proven to be isomorphic to $C_\bullet(A\#_R B)$ the cyclic module of the algebra. A spectral sequence is established to converge to the cyclic homology of $A\#_R B$. Examples are provided to show how our results work. Particularly, the cyclic homology of the Pareigis' Hopf algebra is obtained in the way. This is a joint work with Haihong Hu.

Guanlian Zhang (Shanghai Jiaotong Univ.)

Canonical bases, perverse sheaves and Ringel-Hall algebras

In this talk, we will discuss perverse sheaves, canonical bases of quntum groups, Ringel-Hall algebras and the relation between them. We will also construct affine canonical bases by the representations of affine quiver. Furthermore, the canonical bases of the positive part of the quantum extended Kac-Moody algebras are constructed.

Osamu Iyama (Nagoya Univ.)

Stable categories of Cohen-Macaulay modules and Cluster categories

We will compare two well-known classes of Calabi-Yau triangulated categories in representation theory. One is the stable categories of maximal Cohen-Macaulay modules over Gorenstein isolated singularities (Auslander-Reiten), and the other is the cluster categories of certain finite dimensional algebras (Keller, Amiot, Guo). We will construct triangle equivalences between them. The key role is played by cluster tilting theory, which is Calabi-Yau analogue of tilting theory. This is a joint work with Amiot and Reiten.

Zhongguo Zhou (Hohai Univ.)

Irreducible Characters for Algebraic Groups in Characteristic Three

By using a theorem of Xi Nanhua and the Matlab software, we determine the irreducible characters for the simple algebraic groups of type A_5 over an algebraically closed field K of characteristic 3. In this talk, I will explain how to obtain these results effectively. Some observation from the results will be also given.

Jianyi Shi (East China Normal Univ.)

On a conjecture of Lusztig for the function a

Let H be the Iwahori-Hecke algebra of a Coxeter system (W, S) with unequal parameters. Lusztig defined two functions a and a' on W with values in $\mathbb{N} \cup \{\infty\}$ and conjectured that the equation $a = a'$ holds under the assumption that the values of a on W is bounded. In my talk, I first give a negative answer to the conjecture of Lusztig by providing a counter-example in the case where W is the affine Weyl group of type $\widetilde{A}_{10}$, then I formulate a new conjecture on the function a and provide some examples to support my conjecture.

Susumu Ariki (Osaka Univ.)

Positivity of certain polynomials and relative decomposition matrices

Recently, Brundan and Kleshchev showed by using KLR algebras that cyclotomic Hecke algebras are graded algebras. On the other hand, Geck and Rouquier showed the existence of a relative decomposition map between $q =$ generic and $q =$ a root of unity. Combining the two, it is natural to expect the existence of its graded analogue in some sense. For that to hold, the first necessary condition is the positivity of certain polynomials. I explain that the positivity actually holds. This is a joint work with Jacon and Lecouvey.

Etsuro Date (Osaka Univ.)

On quotients of the Onsager algebra

The Onsager algebra was first found in the study of free energy of 2D Ising model in 1940s. In 1980s it reappeared in the study of solvable models in 2D field theories. After reviewing these backgrounds briefly, I will explain the structure of quotients of this algebra.

Qiang Fu (Tongji Univ.)

Quantum affine $\mathfrak{gl}_n$ and affine q-Schur algebras

Beilinson-Lusztig-MacPherson (BLM) realized quantum $\mathfrak{gl}_n$ using q-Schur algebras. We will study the BLM realization problem of quantum affine $\mathfrak{gl}_n$. Moreover we will study the polynomial representation of quantum affine $\mathfrak{gl}_n$ over $\mathbb{C}$. In particular we will classify finite dimensional irreducible representation of affine q-Schur algebras over $\mathbb{C}$, where $q = v^2$ and $v \in \mathbb{C}$ is not a root of unity. This is joint work with Bangming Deng and Jie Du.

Kentaro Wada (RIMS, Kyoto Univ.)

Induction and Restriction functors for cyclotomic q-Schur algebras

In this talk, we define induction and restriction functors between cyclotomic q-Schur algebra of rank n and of rank $n+1$. Then I will talk about some properties of such functors and relations with (higher level) Fock spaces.

Toshiaki Shoji (Nagoya Univ.)

Character sheaves associated to the enhanced nilpotent cone

Let V be an n dimensional vector space over a finite field $\mathbf{F}_q$, and $G = GL(V)$ with Frobenius map F on G and on V. We construct certain simpel perverse sheaves on $G \times V^{r-1}$, which are G-equivariant with respect to the diagonal action of G, and call them character sheaves associated to the enhanced nilpotent cone $\mathcal{N} \times V^{r-1}$, where $\mathcal{N}$ is the usual nilpotent cone on V. Then we define Green functions by making use of those character sheaves, which are G^F-invariant functions on $(\mathcal{N} \times V^{r-1})^F$. We show that such Green functions are closely related to the Kostka functions associated to the complex reflection group $G(r, 1, n)$.

Xiaoqing Yue (Tongji Univ.)

Filtered Lie conformal algebras whose associated graded algebras are isomorphic to that of general conformal algebra gc_1

Let G be a filtered Lie conformal algebra whose associated graded conformal algebra is isomorphic to that of general conformal algebra gc_1. We will prove that $G \cong gc_1$ or $\operatorname{gr} gc_1$. This is a joint work with Yucai Su.

Mei Si (Shanghai Jiaotong Univ.)

Non-vanishing Gram determinants for cyclotomic Nazarov-Wenzl and Birman-Murakami-Wenzl algebras

This is a joint work with H.Rui. In this talk, we determine the blocks of cyclotomic NW algebras (resp. cyclotomic BMW algebras) when the degenerate cyclotomic Hecke algebras (resp. Ariki-Koike algebras) are semisimple over the field. Then we can give a necessary and sufficient condition on non-vanishing Gram determinants for cyclotomic NW and cyclotomic BMW algebras over an arbitrary field. Equivalently, we give a necessary and sufficient condition for each cell module of such algebras being equal to its simple head over an arbitrary field.

Ken-ichi Shinoda (Sophia Univ.)

Gauss sums on finite groups

The classical Gauss sum is defined as a sum over a finite field. In this talk, giving a definition of a Gauss sum over a finite group G associated with a pair of an ordinary represntation and a modular representaion of G, we give an explicit formula for the complex refelection group $G(m, 1, n)$. Survey of relating results and other examples will also be given.

Hyohe Miyachi (Nagoya Univ.)

Hidden Hecke Algebras and Duality

I will talk about Hecke algebras which are hidden in q-Schur algebras of type A.

We can show that those hidden Hecke algebras are defined as Yoneda algebras of some simple modules, are isomorphic to some Ariki-Koike algebras, and depend only on the derived equivalence classes of q-Schur algebra blocks.

I would like to talk about a conjectural role of this hidden Hecke algebra in representation theory. If I have enough time, I would like to talk about the higher level analogue.

(This is a joint work with Joe Chuang.)

For the information of the workshop, please contact to

Hebing Rui
Department of Mathematics
East China Normal University
hebingrui@gmai.com

Jiachen Ye
Department of Mathematics
Tongji University
jcye@tongji.edu.cn

Toshiaki Shoji
Graduate School of Mathematics
Nagoya University
shoji@math.nagoya-u.ac.jp