Quantum groups, categorification and braids: conference on the occasion of Christian Kassel's 60th birthday

Welcome **Registration** **Program** **Participants** **Support/Contact** **Practical Information**

Timetable

19 Sept.		20 Sept.		21 Sept.	
9:00-09:30	Welcome to you !				
09:30-10:30	V. Turaev	09:30-10:30	B. Keller	09:30-10:30	D. Bar-Natan
10:30-11:00	Coffee break	10:30-11:00	Coffee break	10:30-11:00	Coffee break
11:00-12:00	C. Blanchet	11:00-12:00	C. Stroppel	11:00-12:00	B. Leclerc
12:00-14:00	Lunch	12:00-14:00	Lunch	12:00-14:00	Lunch
14:00-15:00	P. Vogel	14:00-15:00	D. Hernandez	14:00-15:00	C. Reutenauer
15:00-15:30	Coffee break	15:00-15:30	Coffee break	15:00-15:30	Coffee break
15:30-16:30	E. Vasserot	15:30-16:30	J. Bichon	15:30-16:30	H.-J. Schneider
16:45-17:45	P. Dehornoy	16:45-17:45	C. Soulé	16:45-17:45	E. Aljadeff
		20:00-	Dinner		

Place

The talks will take place in the "*Grand Amphithéâtre*" which is located in the main building next to the IRMA. (This building is number 49 on this interactive map, while the IRMA is number 48.)

Talks

Eli ALJADEFF: POLYNOMIAL IDENTITIES AND GRADED ALGEBRAS

We consider G-graded algebras and their corresponding graded identities. In the lecture, I'll present generalizations of some fundamental results in PI theory (originally proved by Kemer for $G= \{e\}$) in the context of G-graded algebras where G is an arbitrary finite group. The same statements for H-comodule algebras (where H is an arbitrary semisimple Hopf algebra) are open. In special cases, graded polynomial identities were used in the construction of generic algebras and following the spirit of Amitsur we apply them to the theory of division algebras. Similar constructions were proved to exist also in the context of H-comodule algebras. This lecture is based on the work of Belov, Giambruno, Haile, Karasik, Kassel, Natapov and myself.

Dror BAR-NATAN: FACTS AND DREAMS ABOUT V-KNOTS AND ETINGOF-KAZHDAN

I will describe, to the best of my understanding, the relationship between virtual knots and the Etingof-Kazhdan quantization of Lie bialgebras, and explain why, in my humble opinion, both topologists and algebraists should care. I am not happy yet about the state of my understanding of the subject but I haven't lost hope of achieving happiness, one day. See my page.

Julien BICHON: FINITE QUANTUM GROUPS AND QUANTUM PERMUTATION GROUPS

This talk is based on joint work with Teodor Banica and Sonia Natale. A quantum permutation algebra is a Hopf algebra having the diagonal algebra k^n as a faithful comodule algebra. The corresponding quantum group acts faithfully on a finite classical space and is called a quantum permutation group. Several unexpected Hopf algebras appear as quantum permutation algebras and so it is natural to ask if any finite-dimensional semisimple Hopf algebra is a quantum permutation algebra, i.e. if a Cayley theorem holds for finite quantum groups. We show, by considering bicrossed products associated to exact factorizations of finite groups, the existence of a semisimple Hopf algebra of dimension 24 that is not a quantum permutation algebra. This example is minimal since on the other hand, we show that any semisimple Hopf algebra of dimension less than 23 is a quantum permutation algebra.

Christian BLANCHET: NODAL FOAM ALGEBRAS AND LINK HOMOLOGY

Natural cobordisms between spin networks are so-called spin foams or simply foams. Nodal foam algebras are graded algebras indexed by trivalent planar graphs. They are generated by foams with nodal singularities quotiented by local relations similar to those used in skein theory, but now for 2-dimensional objects embedded in dimension 4. We compute the graded Grothendieck group of these algebras and explain their role in categorification of Homflypt skein theory.

Patrick DEHORNOY: SET THEORY FIFTY YEARS AFTER COHEN

We present a few results of modern Set Theory, with a special emphasis on the Continuum Hypothesis and the possibility of solving the question after the well known negative results of Godel and Cohen. The developments of the past two decades arguably prove that the problem makes sense, and very recent results seem to pave the way for a possible solution.

David HERNANDEZ: ANNEAU DE GROTHENDIECK QUANTIQUE, ALGÈBRES DE HALL DÉRIVÉES ET CATÉGORIFICATIONS DE C[N]

(Travail en commun avec Bernard Leclerc.) Nous obtenons une présentation de l'anneau de Grothendieck t-déformé de U_q(Lg) pour g de type ADE. Nous obtenons en particulier que cet anneau t-déformé est isomorphe à une algèbre de Hall dérivée. Nous étudions des sous-catégories tensorielles dont l'anneau de Grothendieck t-déformé est isomorphe à la partie positive U_q(n) de U_q(g). En conséquence, ces catégories donnent de nouvelles catégorifications de l'anneau C[N] des coordonnées d'un groupe algébrique N d'algèbre de Lie n, avec sa base canonique duale.

Bernhard KELLER: MUTATION DES CARQUOIS ET DILOGARITHMES QUANTIQUES

La mutation des carquois est une opération élémentaire sur les carquois (=graphes orientés) qui est apparue en physique dans la dualité de Seiberg dans les années 90 et en mathématiques dans la définition des algèbres amassées par Fomin-Zelevinsky en 2002. Dans cet exposé, je montrerai comment, en comparant des suites de mutations de carquois, on peut construire des identités entre produits de séries dilogarithmiques quantiques. Ces identités généralisent l'identité du pentagone due à Faddeev-Kashaev-Volkov ainsi que les identités obtenues récemment par Reineke. Moralement, les nouvelles identités sont des conséquences de la théorie des invariants de Donaldson-Thomas raffinés de Kontsevich-Soibelman. Elles peuvent se démontrer rigoureusement grâce à la théorie qui relie les algèbres amassées aux représentations de carquois.

Bernard LECLERC: QUANTUM CLUSTER ALGEBRAS AND QUANTUM GROUPS

Les travaux de Berenstein-Zelevinsky et Fock-Goncharov fournissent une notion d'algèbre amassée quantique. Je montrerai dans cet exposé que beaucoup d'algèbres quantiques apparaissant en théorie de Lie admettent une structure d'algèbre amassée quantique : anneaux de coordonnées de matrices quantiques, anneaux de coordonnées de sous-groupes unipotents, etc. Il s'agit d'un travail commun avec C. Geiss et J. Schröer.

Christophe REUTENAUER: STURMIAN BASES

Sturmian words have many connections with free groups (cf. work of Kassel, see the poster of the conference, and others). Here, we show how the theory of Sturmian words allows to construct positive bases of the subgroups of finite index of free groups. (This is joint work with Berstel, De Felice, Perrin, Rindone.)

Hans-Jürgen SCHNEIDER: HOPF ALGEBRAS AND ROOT SYSTEMS

The general theme of the talk is related to the classification of pointed Hopf algebras, and the definition of invariants of Nichols algebras of Yetter-Drinfeld modules over arbitrary Hopf algebras (in particular of the associated graded Hopf algebra of a pointed Hopf algebra) such as its generalized root system and its Weyl groupoid. The talk is based on joint work with Andruskiewitsch and Heckenberger, and with Heckenberger.

Christophe SOULE: MINIMA SUCCESSIFS ET SURFACES ARITHMÉTIQUES

Let L be an hermitian line bundle on an arithmetic surface X. One considers the cohomology of X with coefficients in L. Equipped with the L2-metric, this cohomology is a euclidean lattice. One gives bounds for the successive minima of this euclidean lattice.

Catharina STROPPEL: CATEGORIFICATION OF FRACTIONS VIA EULER CHARACTERISTICS

Khovanov homology associates to each knot a homology group which categorifies the Jones polynomial. In the categorification of the colored Jones polynomial and Reshethikin-Turaev invariants fractional numbers appear. In this talk we discuss the question of a possible categorification. Beside an abstract answer to this problem we illustrate our approach with several examples.

Vladimir TURAEV: From braided categories to 3-manifold invariants and back

Eric VASSEROT: Rational double affine Hecke algebras, affine category O and categorification

Pierre VOGEL: The exceptional hyperalgebra

We construct a family of algebras E_n ($n\geq0$) over the polynomial algebra $Q[\alpha,\beta]$ and associative algebra homomorphisms from $E_p\otimes E_q$ to E_{p+q}. These algebras are strongly related to the conjectural universal exceptional Lie algebra ${\cal E}$. More precisely if the Deligne conjecture about this exceptional Lie algebra is true, then each simple E_n-module induces a well-defined ${\cal E}$-module. We show that every E_n-module induces a representation of the braid group B_n. For $n\leq 7$ we prove that E_n is semisimple (over the fraction field $Q(\alpha,\beta)$) and the number of simple E_n-modules (up to isomorphism) is 1,1,3,6,15,30,66,98. We conjecture that each E_n is semisimple.