SÉMINAIRE NICOLAS BOURBAKI
24-25 JUIN 2000
RÉSUMÉS DES EXPOSÉS

FRENKEL Edward V. – *Vertex algebras and algebraic curves*

Vertex algebras are algebraic objects that formalize the concepts of vertex operators and operator product expansion which originated from physics. They were defined by Borcherds and studied extensively in the last fifteen years. We will show how to attach to a vertex algebra a geometric object: a vector bundle with a flat connection on the formal disc, equipped with a coordinate independent operation. This will enable us to associate to a vertex algebra and an algebraic curve, an invariant called the space of conformal blocks. These spaces reflect the geometric structure of various moduli spaces associated with algebraic curves.

KUDLA Stephen S. – *Derivatives of Eisenstein series and generating functions for arithmetic cycles*

In their classic work Hirzebruch and Zagier showed that certain generating functions whose coefficients are the cohomology classes of curves on Hilbert modular surfaces are the q–expansions of elliptic modular forms of weight 2. In this talk I will describe an analogous family of generating functions whose coefficients arise from arithmetical algebraic geometry, e.g. from 0–cycles on the arithmetic surfaces associated to Shimura curves. The identification of such a function with the derivative of a Siegel–Eisenstein series at its center of symmetry provides a kind of arithmetic analogue of the Siegel–Weil formula.

PIRASHVILI Teimuraz – *Polynomial functors over finite fields* [*after Franjou, Friedlander, Henn, Lannes, Schwartz, Suslin*]

For finite fields there is an essential difference between polynomial maps and polynomials. This yields two different versions of polynomial endofunctors of finite vector spaces. The first one is closely related to unstable modules over the Steenrod algebra, while the second one is related to representations of algebraic groups. Recent works by Betley, Franjou, Friedlander, Suslin and others lead to a comparison theorem between the associated *Ext*-groups. These results are a key for the solution of Betley-Pirashvili conjecture involving the stable K-theory of Waldhausen, and for computation of cohomology of the general linear group over finite fields with twisted coefficients.

TURAEV Vladimir G. – *Faithful representations of the braid groups*

Recently D. Krammer and S. Bigelow showed that a certain homomorphism of the group of braids on n strings B_n to a group of real matrices is injective for all $n \geq 1$. This answers in the positive the long-standing question of linearity of B_n. We shall discuss these results of D. Krammer and S. Bigelow as well as earlier results of J. Moody (1991) and others on the non-faithfulness of the classical Burau representation of B_n.

VAN MOERBEKE Pierre – *Permutations et matrices aléatoires, intégrales matricielles et systèmes intégrables*

La distribution statistique de la longueur de la plus longue sous-suite croissante d'une permutation aléatoire est liée à certaines intégrales matricielles sur les groupes ($\mathrm{SO}(n)$ ou $\mathrm{SU}(n)$), par la correspondance de Robinson-Shensted-Knuth. Après insertion de paramètres «temps», les intégrales ainsi obtenues satisfont non seulement à des équations linéaires (contraintes de Virasoro), mais aussi à des équations non-linéaires intégrables (réseau de Toda et autres). Ceci montre que la fonction génératrice de la distribution ci-dessus satisfait à l'équation de Painlevé V. Cette problématique est également liée à la question du spectre de matrices aléatoires.