1014-14-18 **Mikhail Kapranov***, Yale University. *Riemann-Roch for determinantal gerbes and infinite-dimensional bundles.*

Let $\pi : \Sigma \to B$ be a smooth circle fibration over a base B and E be a complex vector bundle on Σ. Then $p_*(E)$, the L^2-direct image of E is an infinite-dimensional bundle on B. This bundle has a $GL(\infty)$-structure where $GL(\infty)$ is the "Japanese" group of automorphisms of a polarized Hilbert space. The determinantal central extension of $GL(\infty)$ gives rise to the determinantal class $C_1(p_*(E)) \in H^3(B, \mathbf{Z})$.

An interesting example is when $B = C^\infty(S^1, X)$ is the free loop space of an algebraic variety X, when $\Sigma = S^1 \times B$ and E is the pullback of the tangent bundle on X under the evaluation map $\Sigma \to X$. In this case $p_*(E)$ is the tangent bundle of B.

A local Riemann-Roch theorem established in a joint work with E. Vasserot in an algebro-geometric situation, describes $C_1(p_*(E))$ as a direct image of a characteristic class on E. In the example above this explains the results of Gorbounov, Malikov and Schechtman on the gerbes of chiral differential operators.

The talk will also discuss a more general "real Riemann-Roch" theorem for a family of real compact manifolds of any dimension d. This theorem is the subject of a work in progress joint with P. Bressler, B. Tsygan and E. Vasserot. (Received April 25, 2005)