Geometry, Groups and Dynamics/GEAR Seminar
(held at the Illinois hub of GEAR)

Thursday, December 4, 2014, 1:00 pm, 243 Altgeld Hall

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Higgs bundles, character varieties and cohomological Hall algebras

Abstract: I'll mainly be talking about the space $M_{g,n}$ of n-dimensional representations of the fundamental group of genus g Riemann surfaces. It has been known (or at least conjectured) for some time that the neatest expression for $p(M_{g,n})$, where p is the mixed Hodge polynomial/Poincare polynomial is best described by considering the partition function $1+p(M_{g,1})z+p(M_{g,2})z^2+...$. An explanation for this is that the cohomology of $M_{g,n}$, which is a moduli space of objects in a 2-CY category (2-CY here is a just a fancy way to package Poincare duality) are related in a natural way to `virtual' or `critical' cohomology of a moduli space of objects in a related 3-CY category. This in turn brings us to the world of DT theory, where these partition functions are somewhat ubiquitous. I'll explain how this all goes, and finish by describing some extra tools and structures on the cohomology of $M_{g,n}$ that arise when we think of it in terms of 3-CY geometry, and relate the above to the conjectures of Hausel and Rodriguez-Villegas on the mixed Hodge polynomials of twisted character varieties, as well as the P=W conjecture relating the weight filtration on cohomology of character varieties to the perverse filtration on the cohomology of Higgs bundles.

Video