

Department of Mathematics and Statistics  
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## COLLOQUIUM

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*Dirac Operators and Unitary Representations*

Friday, December 7, 2007

4:15 p.m., ES 143

Tea at 3:45 p.m., ES 152

### ABSTRACT

In the 1970's, R.Parthasarathy introduced a version of the Dirac operator  $D$  attached to a real reductive group, and used it to construct the discrete series representations. He also obtained a useful necessary condition, Dirac operator inequality, for unitarizability of an irreducible Harish-Chandra module. In 1997 Vogan studied a purely algebraic version of  $D$  and used it to attach an invariant, called Dirac cohomology, to a Harish-Chandra module  $X$ . He conjectured that Dirac cohomology, if nonzero, determines the infinitesimal character of  $X$ . This conjecture was proved by J.-S.Huang and myself in 2002. Subsequently, various authors obtained analogues of this result in several other settings (non-commutative equivariant cohomology, Lie superalgebras, affine Lie algebras). In this talk I will give an overview of this and some related more recent results (joint with J.-S.Huang and D.Renard). I will finish by describing some open questions we are currently trying to settle.