Paul Melvin

Bryn Mawr College

Will present the Twenty-Ninth
William J. Spencer Lecture

Title of Talk:

"Topological 4-Manifolds and Slice Knots"

Thursday, May 3, 2007
2:30 PM
1014 Throckmorton Hall
Kansas State University
Manhattan, Kansas

All are invited

In a spectacular tour de force in 1982, Michael Freedman classified all simply-connected 4-manifolds in terms of two invariants, one simple and one complicated. The simple one is the Kirby-Siebenmann invariant, equal to 0 or 1 according to whether the manifold (stably) admits a smooth structure or not. The complicated one is the intersection form, a nonsingular integral bilinear form associated with the manifold. A lot is known about such forms, although it is hopeless to classify them. Thus in some sense Freedman's work reduced the classification to an intractable algebraic problem! It is nevertheless a remarkable achievement highlighting the salient features of simply-connected 4-manifolds, and in particular implying through the celebrated work of Simon Donaldson that ``most'' of them are not smoothable.

This talk will begin with a leisurely discussion of some of the preceding topics. We will then present some recent work (joint with Hambleton, Friedl and Teichner) showing that the Hambleton-Teichner 4-manifold is not smoothable (which lends credence to the conjecture that every smooth 4-manifold with fundamental group $\mathbb{Z}$ splits off an S^1 \times S^3 factor). We will also describe how our work leads to a new construction of knots in the 3-sphere that are topologically but not smoothly slice.

Paul Melvin, March 27, 2007