

Meeting: 1003, Atlanta, Georgia, SS 1A, AMS Special Session on Current Events

1003-57-1692 **Dusa McDuff***, SUNY at Stony Brook, Department of Mathematics, New York, NY 11794-3651.
Floer Theory and Low Dimensional Topology.

Morse theory gives a way to describe the topology of a surface or manifold in terms of a function defined on it. For this, the most important data are the "critical points" (places where the first derivatives all vanish) and their associated indices (defined using the second derivatives.)

But Morse theory doesn't do so well with functions on infinite dimensional spaces. Floer realized in the late 80's that in some infinite dimensional cases, important in symplectic geometry and in three and four dimensional gauge theory, it is still possible to get information by analyzing gradient flow lines from one critical point to another.

Recently Ozsvath and Szabo found a very geometric context in which to define Floer homology. The invariants they extract agree with invariants defined analytically using solutions to the Seiberg–Witten equations. Because the new invariants are constructed directly from topology, they are well behaved under natural topological operations, making them relatively computable.

I will describe the general shape and properties of Floer homology, contrast it with Morse theory, and give examples. Then I will try to explain how the Ozsvath–Szabo invariants are constructed geometrically, via so-called Heegaard Splittings, and explain some applications. (Received October 07, 2004)