1021-54-2   **Katrin Wehrheim***, Institute for Advanced Study. *Floer theories in symplectic topology and gauge theory.*

"So, what is a Floer theory?!?" It is an infinite dimensional analogue of Morse theory and a powerful tool in symplectic and low dimensional topology. Want to know more?!

I will briefly show how Morse theory captures the topology of a manifold in terms of the critical points and gradient flow lines of a function on the manifold. I will then explain the general structure of a Floer theory: The manifold is replaced by some infinite dimensional function space and the gradient flow equation is replaced by a partial differential equation, which arises from a functional on the function space . This will be illustrated by Floer's two original examples:

Symplectic Floer theory for a Hamiltonian system (or more generally a pair of Lagrangian submanifolds in a symplectic manifold), which uses pseudo-holomorphic curves,

Instanton Floer theory for a closed 3-manifold (really, an integer homology sphere), which uses anti-self-dual connections.

Finally, I will briefly outline the state of my joint project with Dietmar Salamon towards a proof of the Atiyah-Floer conjecture, which relates the symplectic and instanton versions of Floer theory arising from a Heegard splitting of an integer homology sphere.

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