

Lecture 1

The key point of this class will be a discussion of *smooth structures*. As you may recall, a sensational result of Milnor's exhibited exotic spheres with smooth structures – i.e., a differentiable manifold M which is homeomorphic but *not* diffeomorphic to a sphere.

Summary of this result: Look at bundles $S^3 \rightarrow X \rightarrow S^4$, then one can construct some $X \cong S^7 \in \mathbf{Top}$ but $X \not\cong S^7 \in \mathbf{Diff}^\infty$.

It is not known if there are exotic smooth structures on S^4 . The Smooth Poincaré conjecture is that these do not exist; this is believed to be false.