Last time we showed a weaker version of a lemma from Waldhausen.

Lemma 0.1. *Let M be an irreducible compact manifold. Let S, S' be two incompressible compact, closed boundary components of M. Suppose: if k is any closed curves in S, then some non-null multiple of k is homotopic to a curve in S'. Then M is homeomorphic to $S \times I$.*

Today we are going to use Lemma 0.1 to show the following theorem.

Theorem 0.2. *Let M be a 3-manifold, and let S be a surface. Suppose $\pi_1(M) \cong \pi_1(S)$. Then $M \cong S\times$*