Meeting: 999, Nashville, Tennessee, SS 10A, Special Session on Geometry of Hyperbolic Manifolds

999-57-270 **Marc Culler**, IL, and **Peter B. Shalen*** (shalen@math.uic.edu), Dept. of Math., Stats. and Comp. Sci., University of Illinois at Chicago, 851 S. Morgan, Chicago, IL 60607. *Hyperbolic volume and mod 2 homology, Part I.* Preliminary report.

We have proved the following result:

Geometric Theorem. Let M be a closed, orientable, hyperbolic 3-manifold such that $H_1(M; \mathbf{Z}/2\mathbf{Z})$ has rank at least 7. Then the volume of M is at least $2V_3$, where $V_3 = 1.0149\ldots$ is the volume of a regular ideal tetrahedron in $\mathbf{H}^3$.

The proof of the Geometric Theorem involves the following more technical result:

Topological Theorem. Let Let M be a closed, orientable, irreducible 3-manifold such that $H_1(M; \mathbf{Z}/2\mathbf{Z})$ has rank at least 7 and $\pi_1(M)$ has no rank-2 free abelian subgroup. Suppose that $\pi_1(M)$ contains a freely indecomposable subgroup of rank 3. Then some 2-sheeted covering space M_1 of M contains a compact (possibly disconnected) 3-dimensional submanifold X such that (i) ∂X is incompressible, (ii) $-4 \leq \chi(X) \leq -2$, and (iii) $\chi(\overline{X - \Sigma}) \leq -2$, where Σ denotes the characteristic submanifold of X relative to ∂X.

In this talk I will show how to deduce the Geometric Theorem by combining the Topological Theorem with results due to Anderson-Canary-Culler-Shalen and Shalen-Wagreich, and two results due to Agol. (Received August 24, 2004)