This will be an introductory course to geometric group theory, with an overview of (quite a few) related subjects. My plan is to minimize the overlap with the current Math 503 syllabus, so that 503 can be taken later as well. A tentative list of topics (nice and easy) and conjectures (nice and very difficult):

(1) Free groups, Cayley graphs of groups, the van Kampen theorem, group presentations, group actions on complexes, hyperbolic groups and spaces, isoperimetric inequalities, trees, CAT(-1) spaces, the boundary at infinity of a hyperbolic group, Cannon’s conjecture...

(2) Relations to 2-complexes: aspherical complexes, the Whitehead conjecture, the Bestvina-Brady construction, the Andrews-Curtis conjecture...

(3) Relations to 3-manifolds: the Poincaré conjecture (from a group-theoretic perspective), Stallings’ approach (“How not to prove the Poincaré conjecture”), surfaces in 3-manifolds after Kahn-Markovic, some of the recent 3-manifold developments after Agol and others...

There is no required prerequisite and no required textbook. Some familiarity with topology/group theory can be helpful (see the class website for more). The following books could serve as a general guide for topics covered in this course:

- M. Bridson, A. Haefliger. Metric spaces of non-positive curvature.

For further entertainment, here are some relevant Escher’s pictures: