1046-J1-1965   **Douglas Dunham*** (`ddunham@d.umn.edu`), Department of Computer Science, 320 HH, 1114 Kirby Drive, Duluth, MN 55812-3036. *The symmetry of M.C. Escher's* Circle Limit IV *pattern and related patterns.* Preliminary report.

M.C. Escher created four patterns in the Poincaré model of hyperbolic geometry. The last one, *Circle Limit IV*, is an alternating pattern of angels and devils. Escher previously drew a Euclidean pattern of angels and devils as Notebook Drawing 45 and carved a maple ball with that pattern on its surface. The symmetry group of Notebook Drawing 45 is generated by a reflection across the body axis of an angel or devil and a 4-fold rotation about one of its wing tips. This symmetry group is denoted $[4^+, 4]$ in H.S.M. Coxeter's notation, and 4*2 in orbifold notation. On the maple ball some of the angels are indented relative to their surrounding devils, and vice versa. If this indentation is ignored, the symmetry group is $[3^+, 4]$ or 3*2, otherwise it is just the dihedral group D_2, with two perpendicular reflection planes through the poles. In *Circle Limit IV*, some angels and some devils are only outlined. Close inspection reveals the symmetry of the pattern to be just the dihedral group D_3, with three reflection lines through the center. If all the outlines were filled in, symmetry group would be $[4^+, 6]$ or 4*3. By filling in some outlines, and unfilling others, we can obtain other hyperbolic patterns with more interesting symmetry. (Received September 16, 2008)

1