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Douglas Dunham* (ddunham@d.umn.edu), Department of Computer Science, 320 HH,
University of Minnesota Duluth, 1114 Kirby Drive, Duluth, MN 55812-3036. *Patterns with Color
Symmetry on Triply Periodic Polyhedra*. Preliminary report.

We have created repeating patterns on triply periodic polyhedra, unlike other artists, such as M.C. Escher who have created such patterns on closed polyhedra. Triply periodic polyhedra are connected polyhedra that repeat in three independent directions in Euclidean 3-space. We consider triply periodic polyhedra that are composed of copies of a regular p -sided polygon, or p -gon and have congruent vertex figures. If there are q p -gons around each vertex, we must have $(p - 2)(q - 2) > 4$ for the polyhedron to repeat. We call such a polyhedron a $\{p,q\}$ polyhedron (note p and q do not determine the polyhedron).

Some triply periodic polyhedra form polyhedral approximations to triply periodic minimal surfaces (TPMS). In turn, since TPMS's have negative curvature, their universal covering surfaces have the same large-scale geometry as the hyperbolic plane. Thus a repeating pattern on a triply periodic polyhedron will correspond to a repeating hyperbolic pattern, which we thus call the "universal covering pattern" of the patterned polyhedron.

Our main focus will be to show triply periodic polyhedra with patterns that exhibit color symmetry. That is, symmetries of the polyhedra will induce color permutations on their patterns. (Received September 16, 2013)