

1077-B1-2738 **Douglas Dunham*** (ddunham@d.umn.edu), Department of Computer Science, 320 HH, 1114
Kirby Drive, Duluth, MN 55812-3036. *A family of butterfly patterns*. Preliminary report.

M.C. Escher created a repeating Euclidean pattern of butterflies, his Regular Division Drawing number 70. This pattern has symmetry group 632 in orbifold notation (or $p6$ in crystallographic notation). The pattern has a 6-fold rotation axis at the meeting points of left front wings, and a 3-fold rotation axis at meeting points of right rear wings of the butterflies. This pattern also exhibits color symmetry, the color group being S_3 , the symmetric group on three colors. We generalize Escher's butterfly pattern by considering the family of all such patterns with symmetry group $pq2$ in orbifold notation, where p and q are both greater than or equal to three. The patterns are spherical, Euclidean, or hyperbolic depending on whether $(p-2)(q-2)$ is less than, equal to, or greater than four, respectively. Thus, except for eight possibilities, the patterns are hyperbolic. Depending on p and q , the patterns exhibit different kinds of color symmetry. We will show a number of such patterns. (Received September 22, 2011)