Bulletin of Symbolic Logic. 14 (2008) 411.

John Corcoran, *Subregular Tetrahedra*.
Philosophy,
University at Buffalo,
Buffalo, NY 14260-4150
E-mail: corcoran@buffalo.edu

This largely expository lecture deals with aspects of traditional solid geometry suitable for applications in logic courses. A *regular* polygon has equal sides and equal angles. A *subregular* polyhedron has congruent faces and congruent [polyhedral] angles. A subregular polyhedron whose faces are all regular polygons is *regular*. Geometers before Euclid showed that there are “essentially” only five regular polyhedra: every regular polyhedron is a tetrahedron, a hexahedron or cube, an octahedron, a dodecahedron (12 faces), or an icosahedron (20 faces). The first question is whether there are subregular polyhedra that are not regular. Another question is the classification of subregular polyhedra. For example, considering the fact that the regular tetrahedra have equilateral triangles as faces, we ask which triangles other than equilaterals are faces of subregular tetrahedra. Similarly, considering the fact that the regular hexahedra have squares as faces, we ask which quadrangles other than squares are faces of subregular hexahedra. After introductory remarks that include historical and philosophical points, we concentrate on tetrahedra. A triangle that is congruent to each of the four faces of a tetrahedron is called a *generator* of the tetrahedron. The main result proved is that every acute triangle is a generator of a subregular tetrahedron. The proof includes an algorithm –implementable with scissors and paper –that constructs from any given acute triangle a subregular tetrahedron whose faces are congruent to the given triangle. Algorithm: Given any acute triangle. Construct a similar triangle whose sides are double the sides of the given triangle. Draw the three lines connecting the three midpoints of the sides (making four triangles congruent to the given triangle—a central triangle surrounded by three peripheral triangles). Make three “hinges” along the lines connecting the midpoints. “Fold” the peripheral triangles together (into a tetrahedron).