Exploring the Vertices of a Triacontahedron

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Abstract

The rhombic triacontahedron can be used as a framework for locating the vertices of the five platonic solids. The five models presented here, which are made of babinga wood and brass rods illustrate this relationship.

Introduction

My initial interest in the platonic solids began with the work of Cox [1]. My initial explorations of the platonic solids lead to the series of models *Polyhedra through the Beauty of Wood* [2]. I have continued this exploration by using a rhombic triacontahedron at the core of my models and illustrating its relationship to all five platonic solids.

Rhombic Triacontahedron

The rhombic triacontahedron has 30 rhombic faces where the ratio of the diagonals is the golden ratio. The models shown in Figures 1, 2, 4, and 5 illustrate that the vertices of an icosahedron, dodecahedron, hexahedron and tetrahedron all lie on the circumsphere of the rhombic triacontahedron. In addition, Figure 3 shows that the vertices of the octahedron lie on the inscribed sphere of the rhombic triacontahedron.

Creating the Models

Each of the five rhombic triacontahedrons are made of 1/4 inch thick babinga wood. The edges of the rhombi were cut at 18 degrees on a band saw. After the assembly of the triacontahedron 1/8 inch brass rods were inserted a specific vertices and then fitted with 1/2 inch cocabola wood spheres. Different vertices (or faces in the case of the octahedron) were chosen for each platonic solid. The total size of each model is about 5 inches by 5 inches by 5 inches.

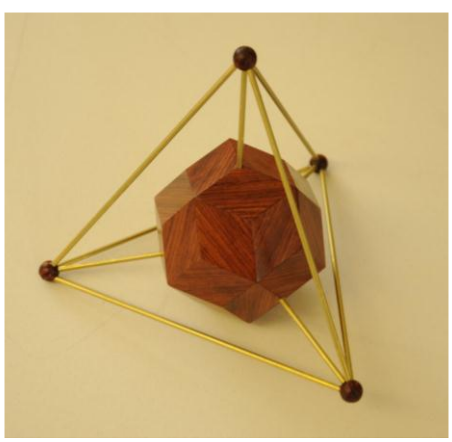

Figure 1: *Tetrahedron*

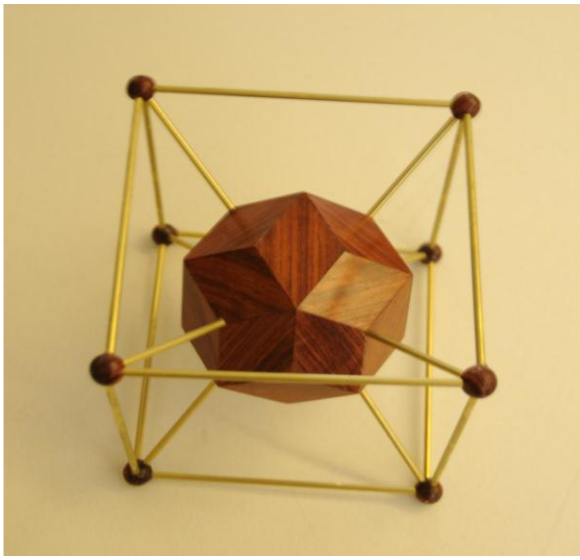

Figure 2: *Hexahedron*

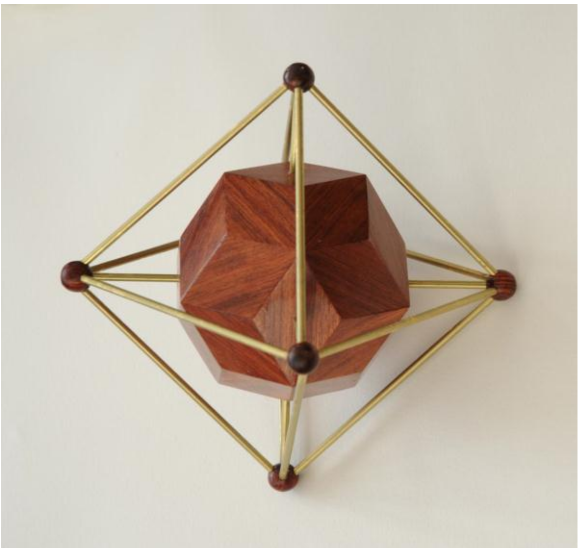

Figure 3: *Octahedron*

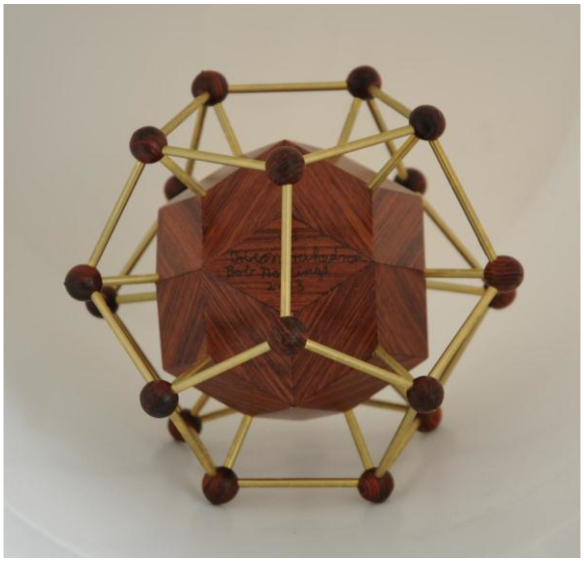

Figure 4: *Dodecahedron*

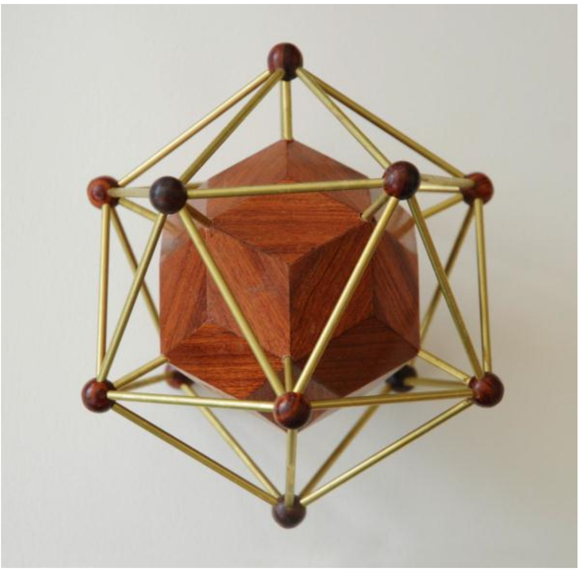

Figure 5: *Icosahedron*

References

[1] J. Cox, *Beyond Basic Turning*, Linden Publishing Co, Fresno, 1993.
[2] R. Rollings (2010). Polyhedra expressed through the beauty of wood, *Journal of Mathematics and the Arts*, Vol. 4, 191 – 200.