Mathematical Iconography in Gaudi's Cosmos

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Abstract

The architect Antonio Gaudi created visionary imagery from often profoundly mathematical forms. A sculpture in the garden of his home in Parc Guell ,Barcelona, embeds the Platonic solids and uses these to represent the heavens in the same cosmographic spirit as that of Johannes Kepler in his Harmonices Mundi.

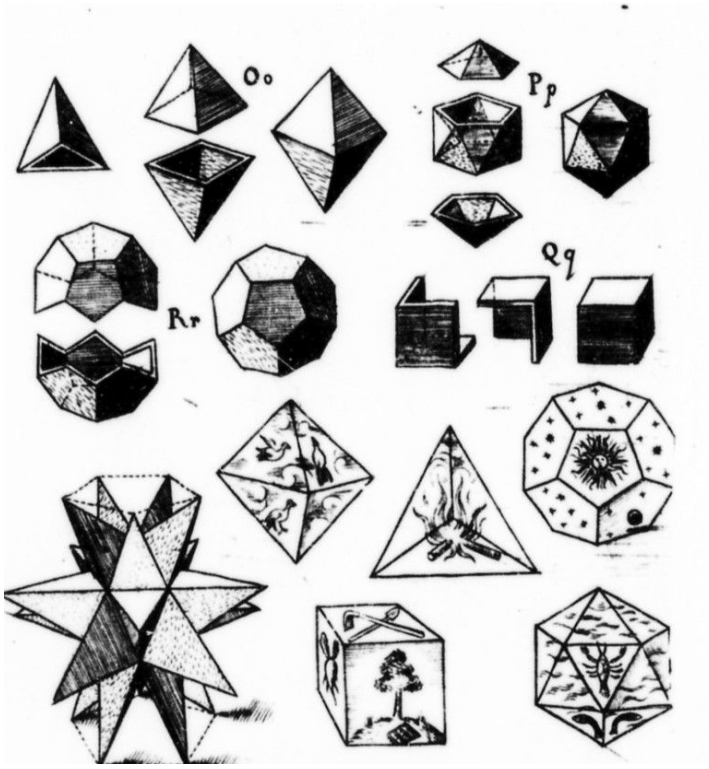
In the garden of Antonio Gaudi's home in Barcelona's Parc Guell stands a sculpture by the famed architect entitled "Cosmos". Actually a copy of an ornament cresting a spire on his unfinished temple, the grand Sangrada Familia, it nevertheless carries all the spatial integrity and thematic clarity of an exceptional stand-alone sculpture. A key ingredient is Gaudi's masterful inclusion of significant mathematical forms, especially those introduced by Johannes Kepler in his 1619 text Harmonices Mundi.

Figure 1: *Antonio Gaudi, Cosmos, ferro-concrete, ca.1907.* **Figure 2:** *detail of Cosmos.*

The sculpture (Figures 1 and 2) presents as a concrete nebula embedded with stars out of which a hawk-like bird streaks earthward. The stars radiate three-dimensionally with various numbers of points spiking outward. About half of the spikes remain embedded in the cloud with the others bristling outward. A closer inspection reveals that these stars possess 4, 6, 8, 12, and 20 points respectively and that they are actually stellated versions of the five Platonic solids.

The star-studded nebula clearly supports the title "Cosmos", but the integration of the Platonic solids greatly extends the sculpture's cosmographic complexity. Historically, the solids have served as insignia

of four classical elements of earth, air, fire and water, plus the fifth element – the quintessence – that to the ancients formed the crystalline substrate of the celestial spheres (Figure 3, lower right.) In this symbolic scheme the hexahedron, octahedron, tetrahedron and icosahedron reference the first four elements respectively, while the dodecahedron signifies the quintessence. A second cosmographic allusion is Kepler's "discovery" that the spheres of the planetary orbits have their proportions determined by these same five polyhedrons (Figure 4.) Gaudi's forms also reference the stellations described in Kepler's Harmonices Mundi of 1619.



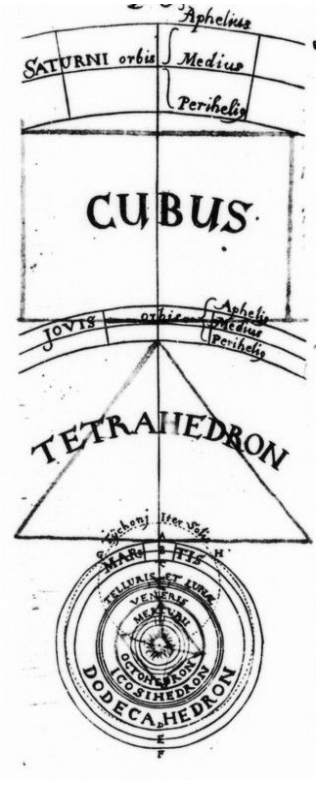


Figure 3: *Johannes Kepler*, *Harmonices Mundi , 1618, detail from page 54.* **Figure 4:** *detail of page 186*

In keeping with the hierarchy implicit in this scheme a single dodecahedral star bobs at the top of the cloud (Figure 2.) Distributed over the cloud below the dodecahedron are two copies each of the hexahedron, the octahedron and the icosahedron, as well as three tetrahedrons. Gaudi's starry polyhedrons are structured so that the point of each ray of the stars corresponds to a vertex of a polyhedron. Given that a dodecahedron has 20 vertices, for example, his dodecahedral star has 20 rays. Technically, the dodecahedron is then the stellated version of its dual, the icosahedron. However, since the star is half submerged in the cloud and its treatment is somewhat loose and organic, it reads primarily as a dodecahedron with each grouping of five points demarcating a pentagon (see stellation in figure 3, lower left.) Similarly, his hexahedral star boasts 8 rays, one for each vertex of the hexahedron. In effect the geometry of each solid is defined by stellations of their duals.

In "Cosmos" Gaudi has orchestrated organic, physical, astronomic, religious and mathematical emblems of the heavens into a churning, multi-layered of faith and nature. In order to do so he needed to understand both the geometry and symbolic history of the Platonic solids, especially as put forth by Kepler.