

Cube defined by a porphyrin group on each face

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<http://homepage.mac.com/whitby/>

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<http://web.me.com/whitby/Octahedron/Welcome.html>

References

1. Octahedron, the Universe defined by Robert William Whitby

A description of the atomic shapes and how they join which follows from the discovery that the periodicity of the atomic elements matches the periodicity of recurring form in which identical regular octahedra combine to form ever larger compound regular octahedra. Octahedron1stEd.pdf shows that the atomic elements are crystalline assemblies of identical regular octahedra and explores the implications of this discovery. 500 pages

See the chapter CRYSTAL.

<http://homepage.mac.com/whitby/FileSharing103.html>

2. Heme, chlorophyll, etc. atomically correct by Robert William Whitby

The file Heme.pdf is an excerpt from Reference 1 which shows how the actual atoms form the pyrrole ring, and how this joins with a five C-atom ring to form the basic subunit of the porphyrin rings of heme, chlorophyll, etc. It shows that the rings can form subunits which mirror one another. Assemblies using identical rings of either type result in assemblies which are mirror images. Either assembly holds the Mg-atom of chlorophyll or the Fe-atom of heme equally well, but the surrounding protein will be affected. It shows how an N-atom can join to an N-atom of the rings and the locations where peptides can join.

<http://homepage.mac.com/whitby/Porphyrins/FileSharing114.html>

3. Porphyrin, phthalocyanine and their relatives by Robert William Whitby

Phthalo.pdf extends the material provided in the Heme chapter of Octahedron1stEd.pdf. It shows the formation of the rings which pair to provide the subunits for the atom-holding assemblies. It shows how the join between rings confers handedness to the assemblies. It shows how the atom-holding cavity is hemi-octahedral and that the cavity of one assembly is identical to that of each of the other assemblies. It shows how one porphyrin can join to another if they are of opposite hand and inverted relative to one another. It shows how the paired ring subunits can form chains if they are of the same hand. The file is one MB in size because the 19 figures show the atoms in epn-detail, the highest possible detail. The assemblies are shown both with empty cavities and with atom-filled cavities.

<http://homepage.mac.com/whitby/Porphyrins/FileSharing115.html>

4. Cubic Assembly Encloses Nanovoid–Bulky groups enable macrocycles to pack as nanocubes rather than columnar stacks by Michael Freemantle, *C&E News*, Science & Technology, October 24, 2005, v. 83, No. 43, pp. 62-64

<A novel zinc phthalocyanine compound self-assembles in solution to form a crystalline material containing interconnected solvent-filled cubic voids having nanometer dimensions (Angew. Chem. Int. Ed., published online Oct. 5, dx.doi.org/10.1002/anie.200502668).>

<http://pubs.acs.org/cen/nanofocus/top/83/8343sci3.html>

5. A Phthalocyanine Clathrate of Cubic Symmetry Containing Interconnected Solvent-Filled Voids of Nanometer Dimensions by Neil B. McKeown, Prof., Saad Makhseed, Dr., Kadhum J. Msayib, Dr., Li-Ling Ooi, Dr., Madeleine Helliwell, Dr., John E. Warren, Dr.

(Angew. Chem. Int. Ed., published online Oct. 5, [dx.doi.org/10.1002/anie.200502668](https://doi.org/10.1002/anie.200502668))

Introduction

This document has been prompted by Reference 4 which describes the work related in Reference 5. It shows a way in which six porphyrin groups can structurally assemble so that each defines a face of a cube while having its hemi-octahedral void open to the interior of the cube. The resulting structure has an equilateral triangular opening parallel to each of the faces of a regular octahedron.

Porphyrin cube viewed parallel to a vertexial diameter

Figure 1 shows the assembly of subunits in the two orientations required to form the porphyrin unit of Figure 2.

Figure 2 shows the assembly of the porphyrin unit.

Figure 3 shows three of the porphyrin units of Figure 3 assembled as a triplet.

Figure 4 shows the assembly of units in the two orientations required to form a porphyrin triplet in the obverse orientation.

Figure 5 shows the obverse triplet.

Figure 6 shows the porphyrin cube formed by joining the obverse triplet of Figure 5 with the porphyrin triplet of Figure 3.

Porphyrin cube to porphyrin cube joining

Figure 7 shows three porphyrin triplets joined as an inverted Y.

Figure 8 shows three porphyrin triplets in a triangular assembly.

Porphyrin cube viewed parallel to a facial diameter

Figure 9 shows the assembly of a porphyrin unit which is viewed perpendicular to its axis of fourfold symmetry.

Figure 10 shows four of the porphyrins of Figure 9 assembled as a square ring.

Figure 11 shows a porphyrin viewed parallel to its axis of fourfold symmetry with its hemi-octahedral void towards the viewer.

Figure 12 shows the square ring of Figure 10 joined atop the porphyrin of Figure 11 as an open-faced cube.

Figure 13 shows the porphyrin of Figure 11 in an obverse view.

Figure 14 shows the porphyrin of Figure 13 atop the assembly of Figure 12 completing the cube.

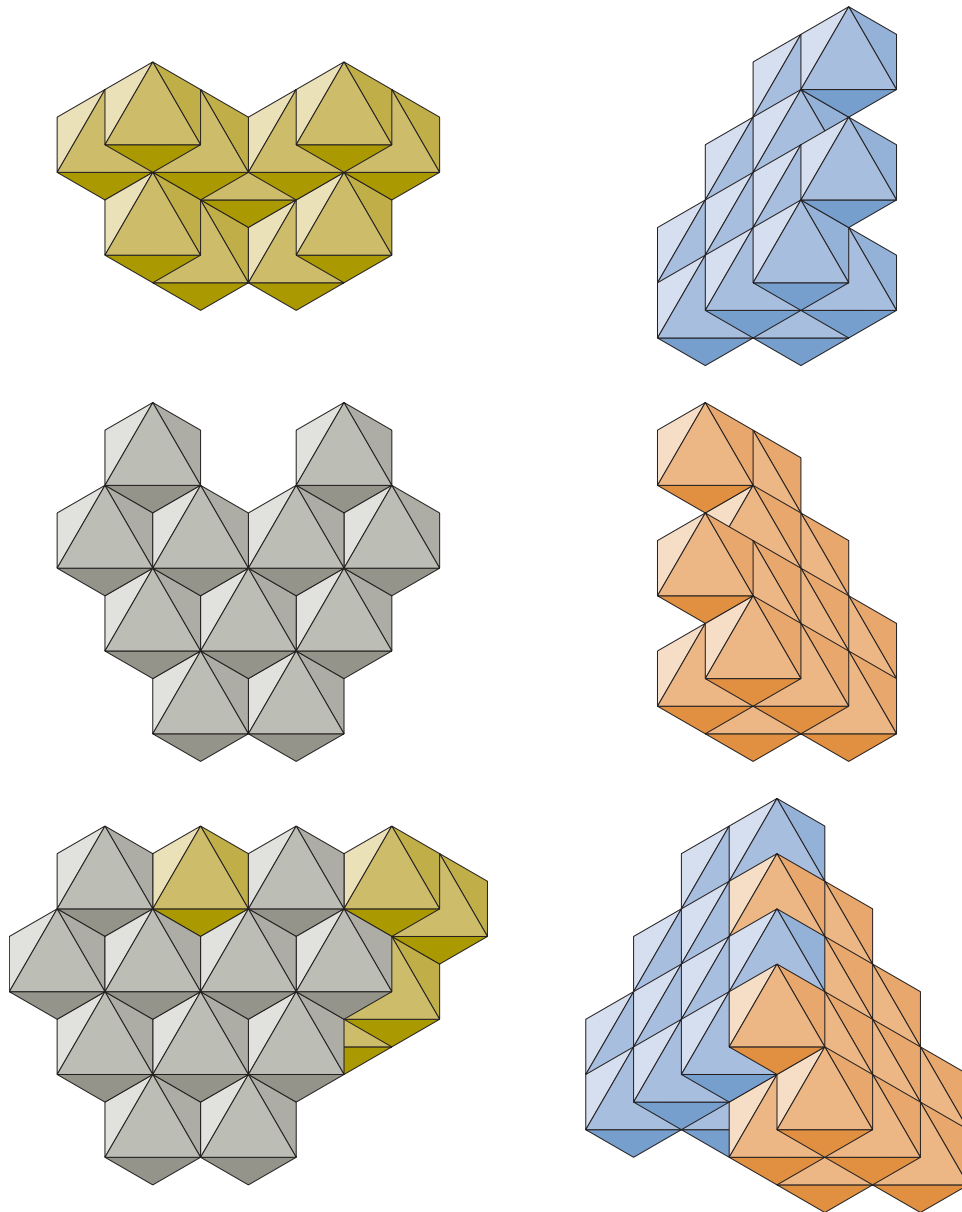


Fig. 1 Porphyrin cube, vertexial view—subunits of porphyrin group
The figure shows the assembling of two subunits of a porphyrin group required as the panels surrounding the far vertex of a porphyrin cube.

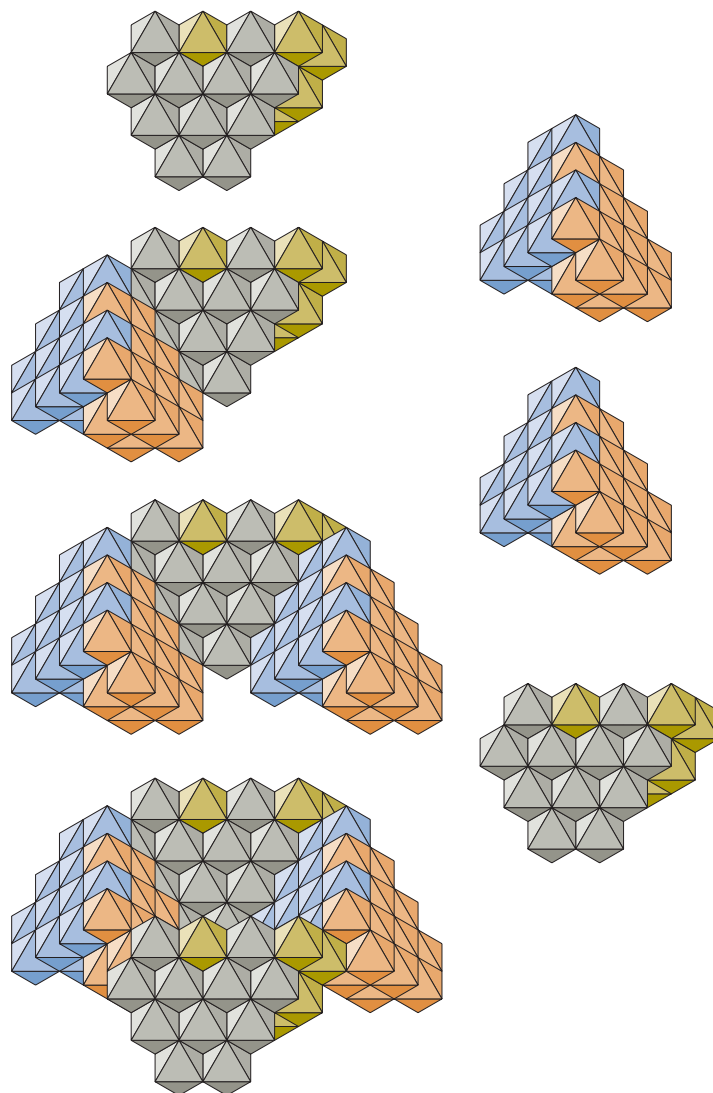


Fig. 2 Porphyrin cube, vertexial view–porphyrin group

The figure shows the assembly of a porphyrin group in the proper orientation for forming panels at the far vertex of a porphyrin cube viewed parallel to its vertexial diameter.

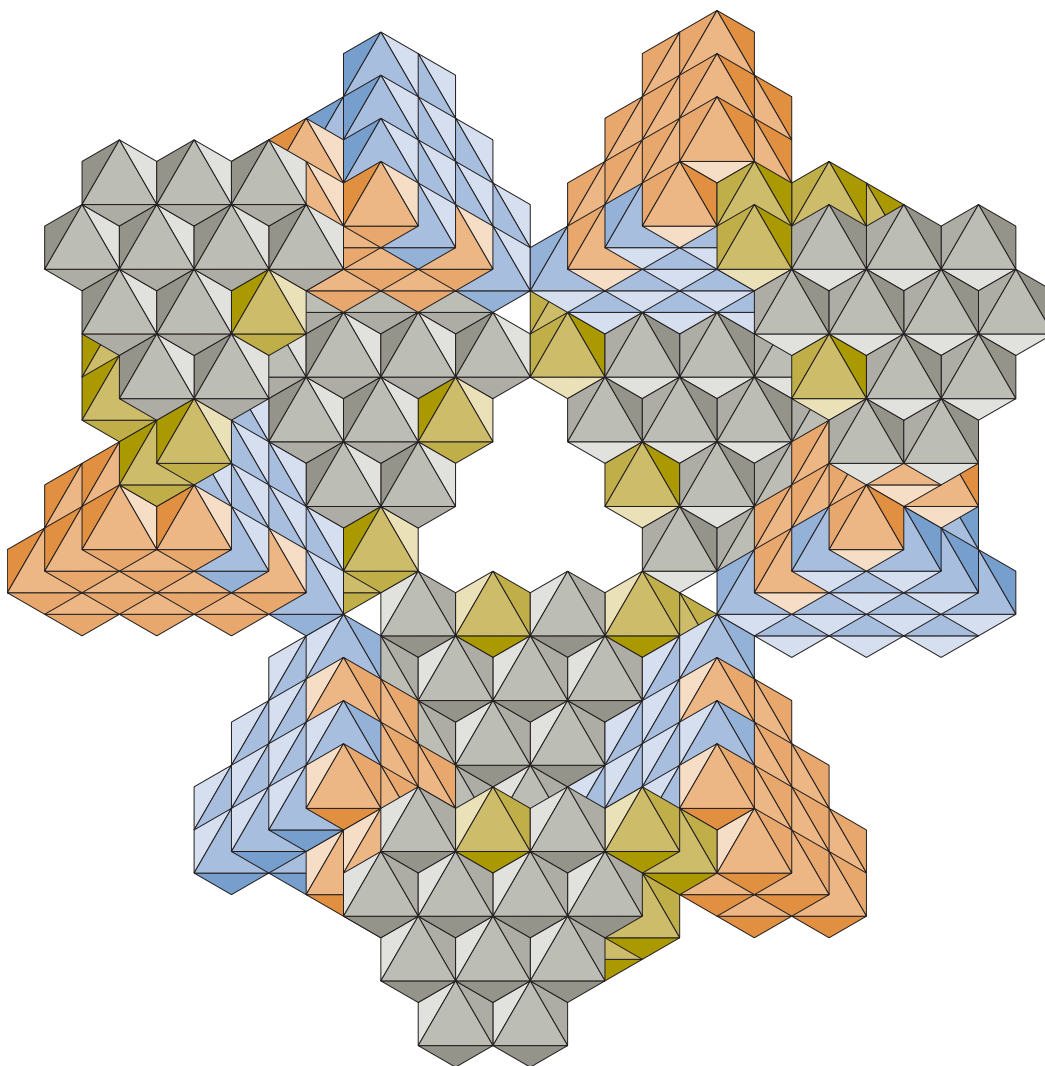


Fig. 3 Porphyrin cube, vertexial view—interior view

Three porphyrin groups identical, except for a one-third turn about the normal to the viewing plane, to the group shown in the previous figure are joined as a triplet. The join between porphyrins consists of two He-octa edges—gray octa to yellow octa and blue octa to blue octa. Each of the hemi-octahedral voids is open to what will become the interior of the fully assembled cube.

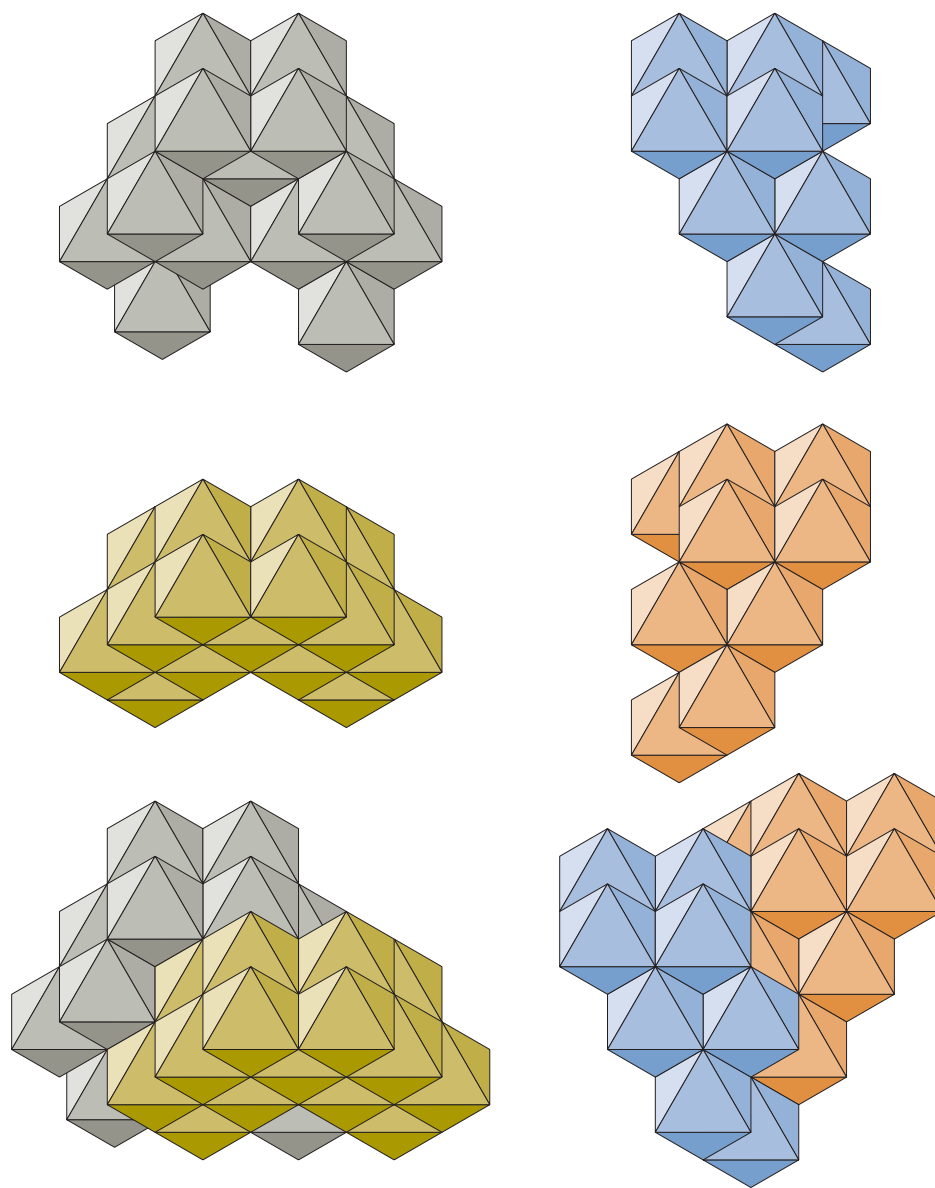


Fig. 4 Porphyrin cube, vertexial view–subunits of porphyrin group for near vertex
The figure shows the assembly of two subunits required to build a porphyrin unit in the proper orientation to act as a panel for the near vertex of the cube.

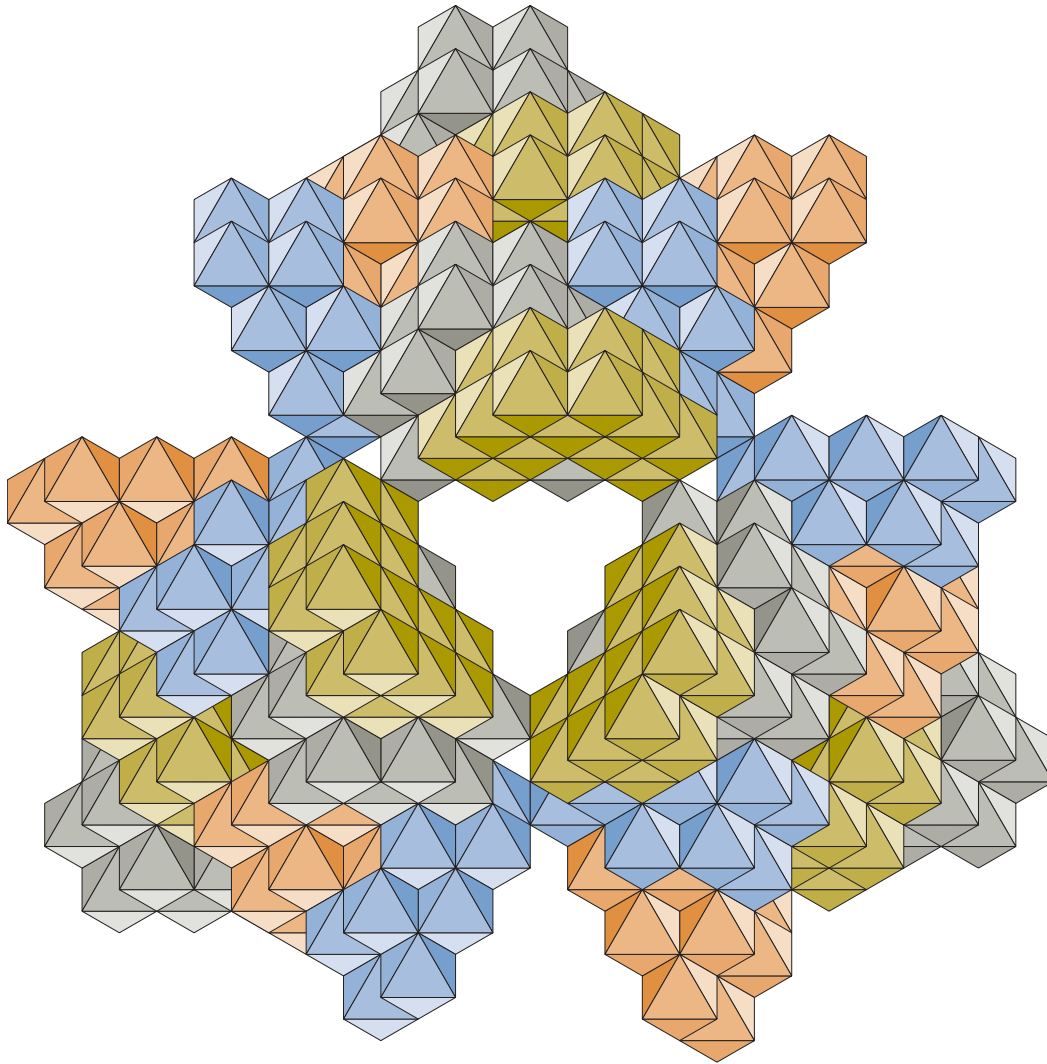


Fig. 5 Porphyrin cube, vertexial view—porphyrin triplet defining the near vertex

The porphyrin group at the top of triplet was constructed using the subunits of the previous figure. The other panels are identical except for a one-third turn rotation about the normal to the viewing plane. This triplet is identical to that of Figure 3 except for a rotation of one-half turn about the bottom edge of the page. Each of the hemi-octahedral voids is directed towards the interior of the cube. The joins between the porphyrin units can also be seen here to be between a gray He-octa and a yellow He-octa and between two blue He-octas.

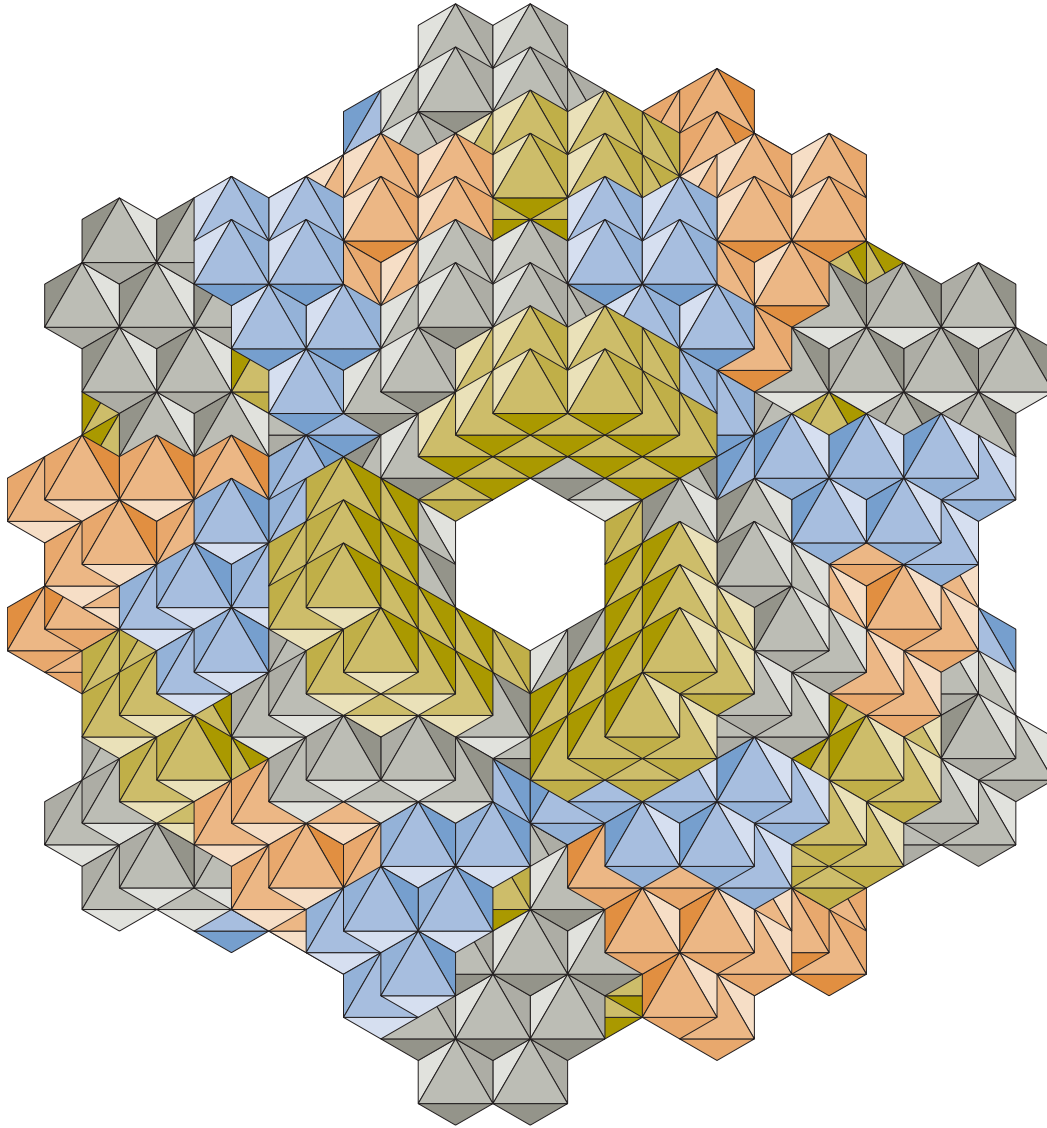


Fig. 6 Porphyrin cube, vertexial view

The figure shows the completed assembly of six porphyrin groups each acting as the facial panel of a cube.

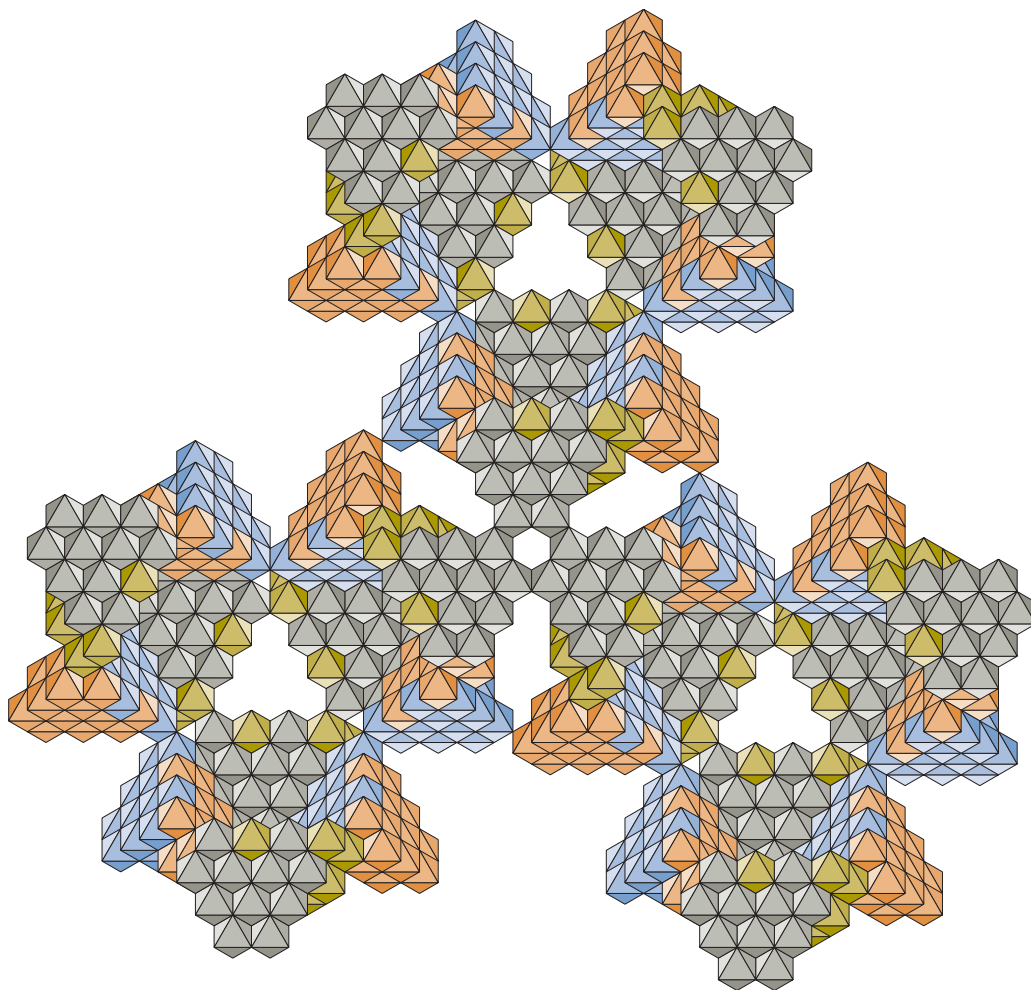


Fig. 7 Porphyrin cube to porphyrin cube joining–Plate I
The figure shows the far vertex portion of three porphyrin cubes linked as a triplet. There is a single He-octa join between each cube portion.

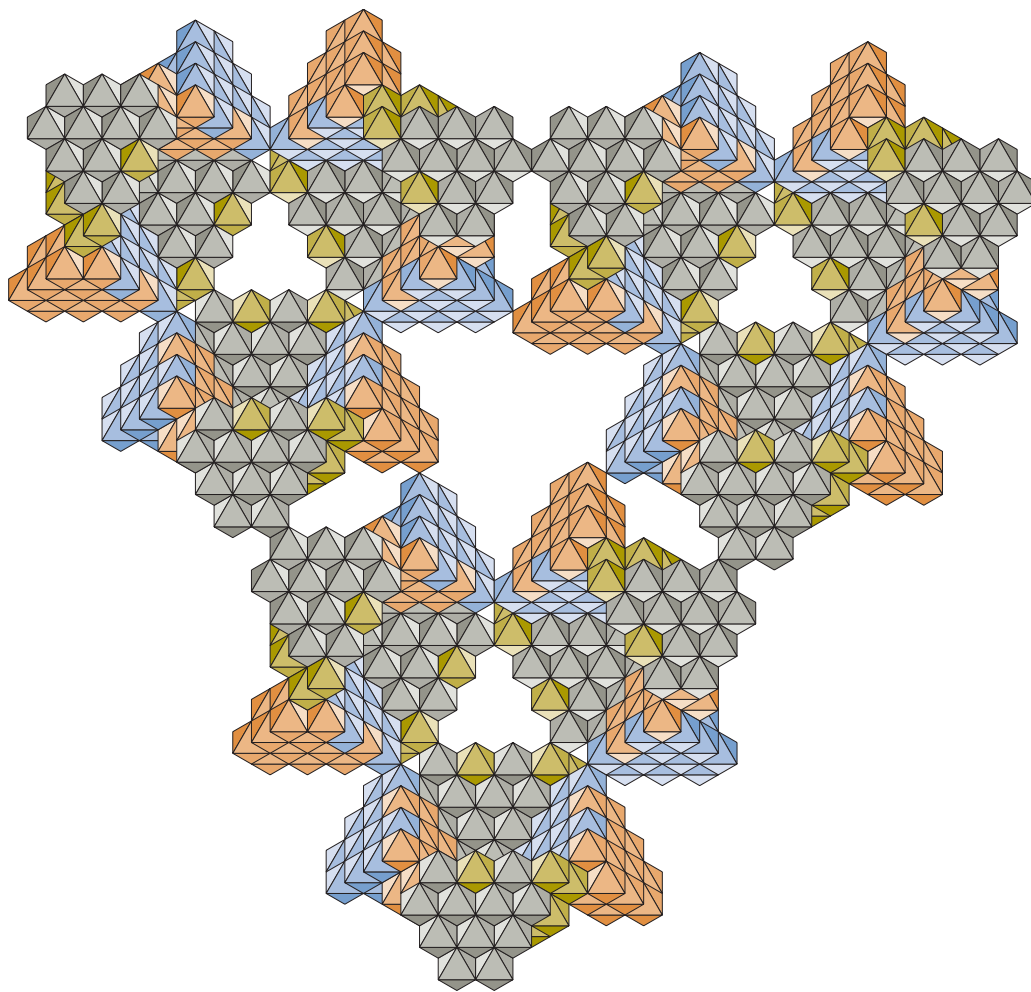


Fig. 8 Porphyrin cube to porphyrin cube joining–Plate II

As in Figure 7, portions of three porphyrin cubes are joined as a planar group. The join between cubes is a single He-octa edge. The pattern of joining in both this figure and the previous figure can be extended indefinitely.

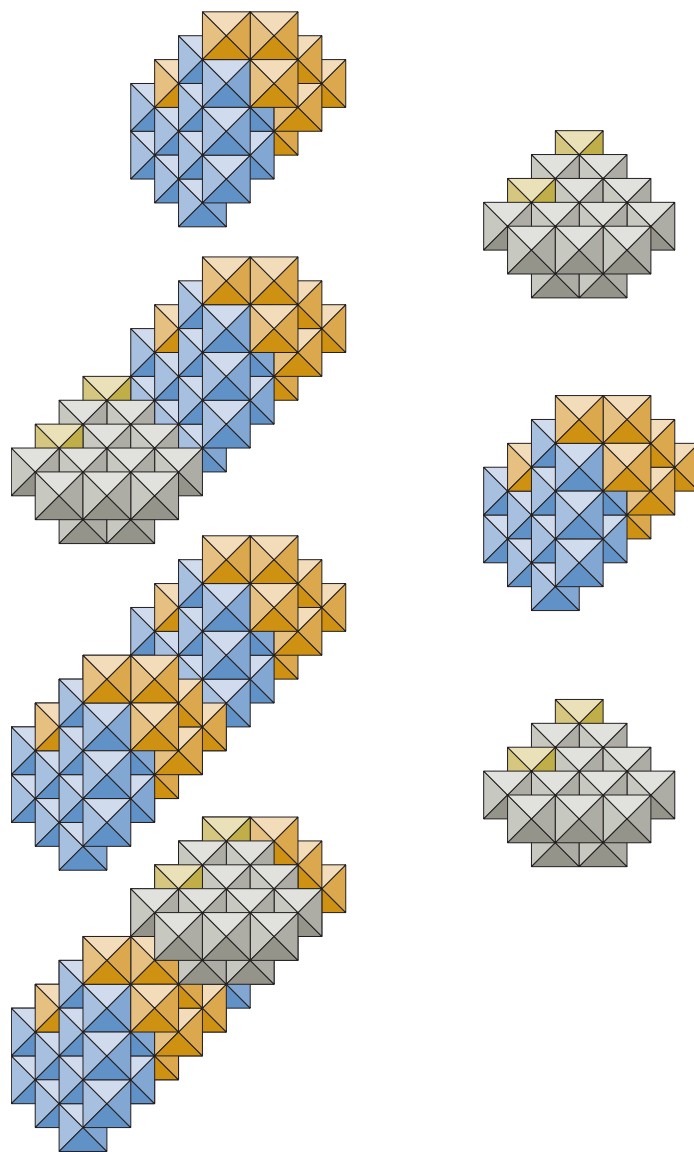


Fig. 9 Porphyrin cube, facial view—assembly of side panel

The figure shows the assembly of a porphyrin group in the orientation required for the side panel of a porphyrin cube viewed parallel to a facial diameter.

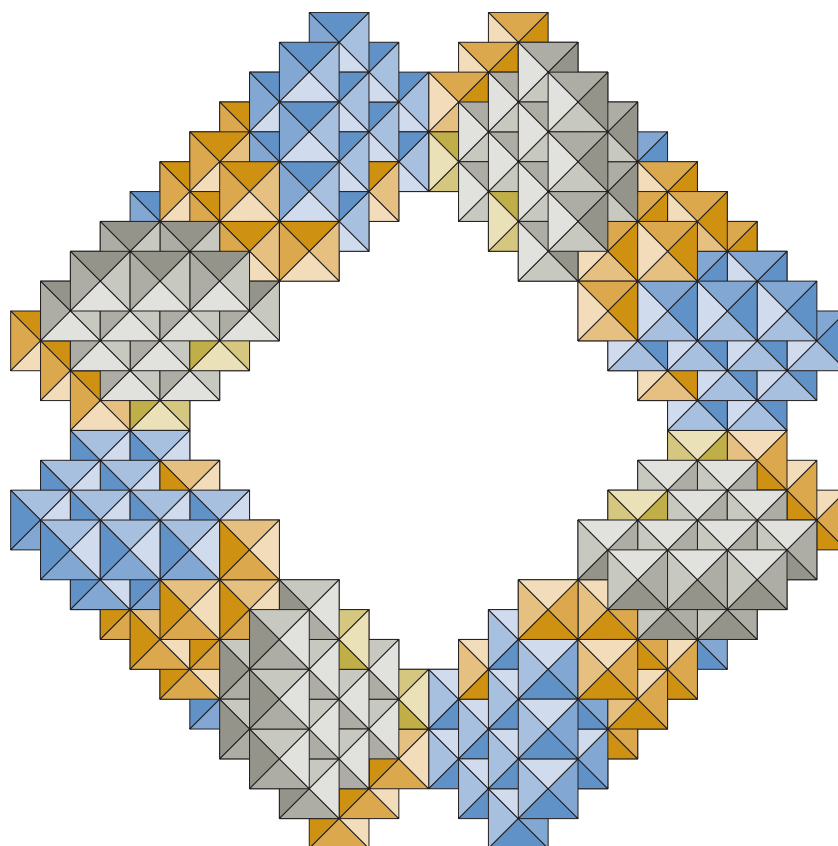


Fig. 10 Porphyrin cube, facial view—assembly of four side panels

The figure shows the assembly of four porphyrin groups as the facial panels of a cube viewed parallel to its facial diameter. Each panel is identical to the porphyrin of the previous figure except that two have been rotated one-quarter turn either clockwise or counterclockwise and one has been rotated one-half turn.

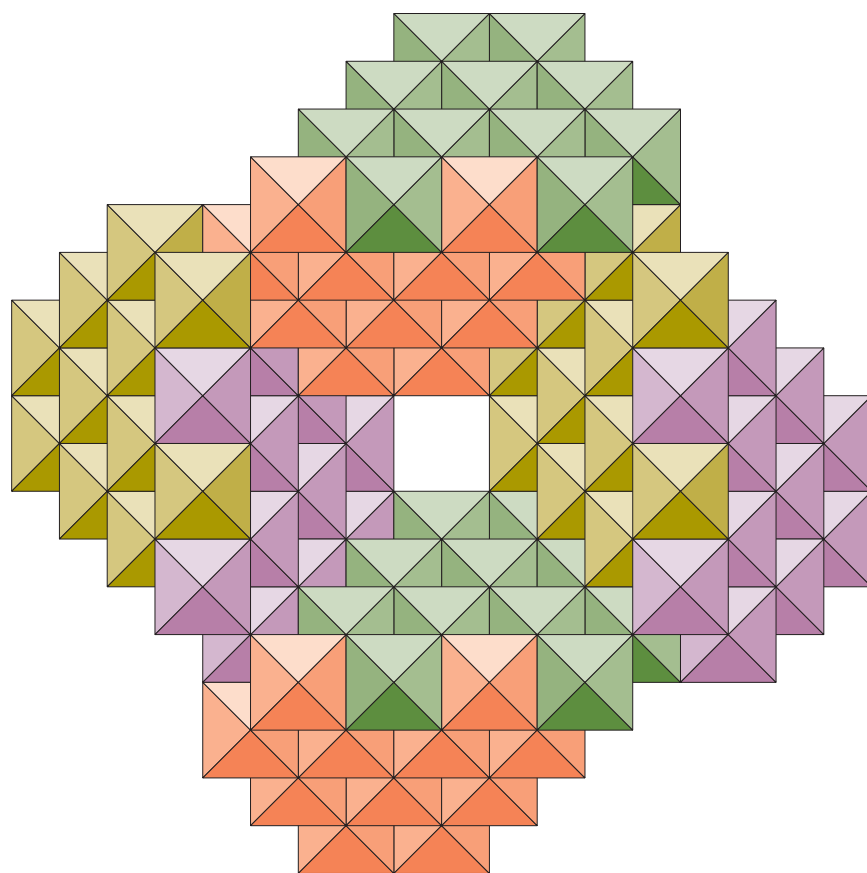


Fig. 11 Porphyrin cube, facial view—bottom panel

The figure shows a porphyrin group viewed along its fourfold axis. The hemi-octahedral void is towards the viewer.

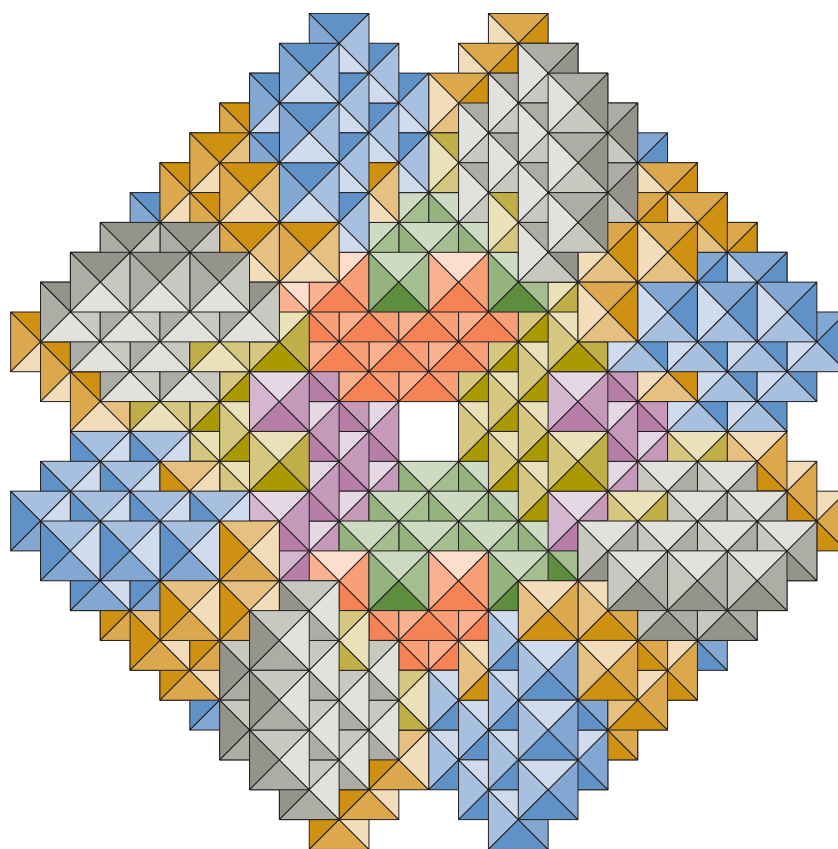


Fig. 12 Porphyrin cube, facial view—one open face

The porphyrin group of the previous figure has been joined with the assembly of four side panels of Figure 10 to produce the open-faced cube shown here.

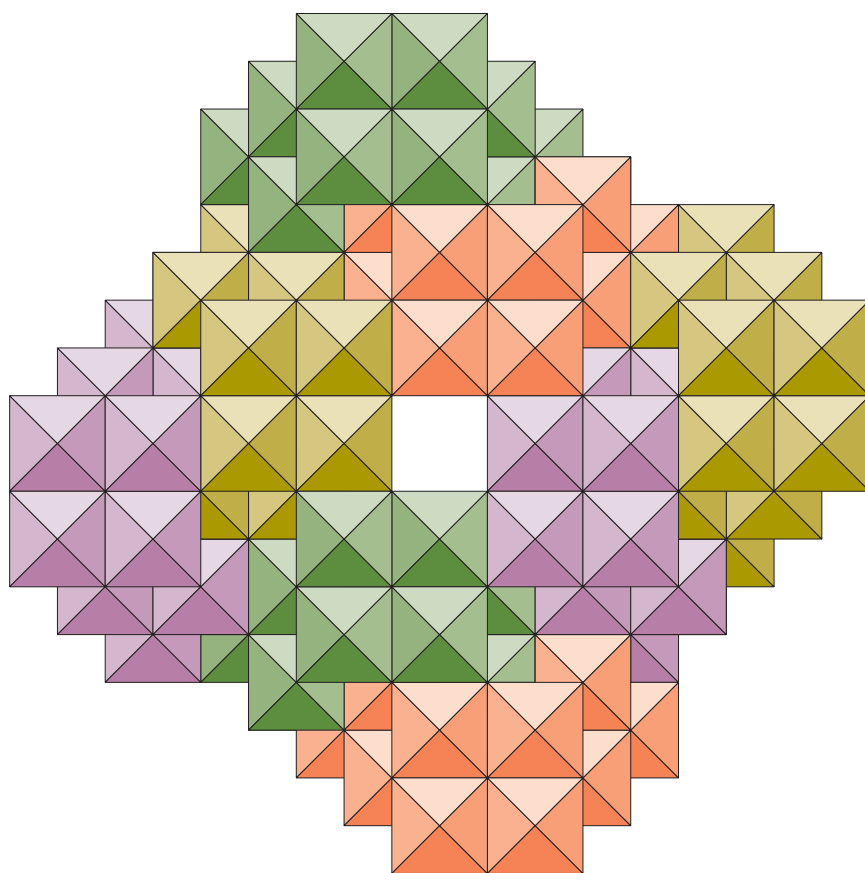


Fig. 13 Porphyrin cube, facial view—top panel

The figure shows a porphyrin group viewed parallel to its fourfold axis. The hemi-octahedral void is turned away from the viewer.

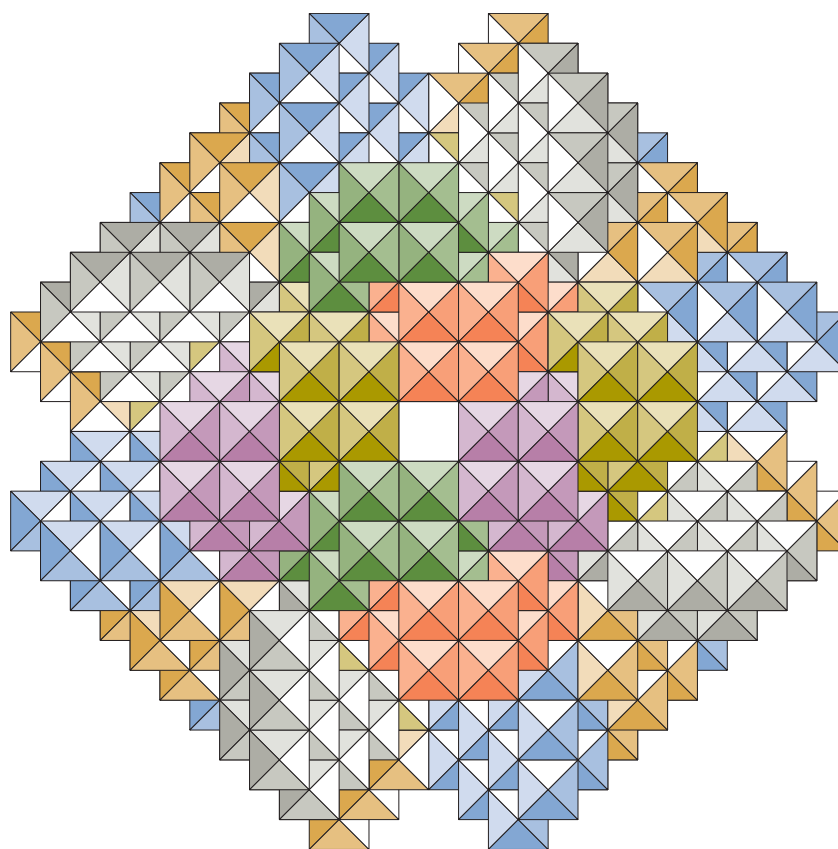


Fig. 14 Porphyrin cube, facial view—complete

The porphyrin group has been added to the open-faced cube of Figure 12 to complete the porphyrin cube viewed parallel to its facial diameter.