

## Tetra- & octa- hedral assemblies of triangular panels of graphite & diamond

Robert William Whitby

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

### References

**1. Octahedron1stEd.pdf** The octahedral periodicity of the Atomic Elements and its implications.

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

**2. GraphitePanels.pdf** Triangular panels composed of graphite CFUs

<http://homepage.mac.com/whitby/Quasicrystals/FileSharing175.html>

**3. DiamondPanels.pdf** Triangular panels composed of diamond CFUs

<http://homepage.mac.com/whitby/Quasicrystals/FileSharing175.html>

**4. QuasicryOcta.pdf** Quasicrystalline octahedron having a single C-atom as a facial panel

<http://homepage.mac.com/whitby/Quasicrystals/FileSharing69.html>

### Introduction

#### Tetrahedral assemblies

The number of C-atoms in a tetrahedral assembly consisting of identical triangular panels is four times the number of CFUs in the panel times the number of C-atoms per CFU. The number of CFUs in a triangular panel is the square of the number of CFUs along the panel's edge. The number of C-atoms in a graphite CFU is three and the number of C-atoms in a diamond CFU is four. The table shows the number of C-atoms in tetrahedral assemblies of triangular graphite and diamond panels.

**Table 1: Tetrahedral assemblies of triangular panels**

CFUs at edge	CFUs/panel	CFUs/ tetrahedron	C-atoms/tetrahedron	
			graphite	diamond
1	1	4	12	16
2	4	16	48	64
3	9	36	108	144
4	16	64	192	256
5	25	100	300	400

**Table 1: Tetrahedral assemblies of triangular panels**

CFUs at edge	CFUs/panel	CFUs/ tetrahedron	C-atoms/tetrahedron	
			graphite	diamond
6	36	144	432	576
7	49	196	588	784
8	64	256	768	1024

**Octahedral assemblies**

The number of C-atoms in an octahedral assembly consisting of identical triangular panels is eight times the number of CFUs in the panel times the number of C-atoms per CFU. The number of CFUs in a triangular panel is the square of the number of CFUs along the panel's edge. The number of C-atoms in a graphite CFU is three and the number of C-atoms in a diamond CFU is four. The table shows the number of C-atoms in octahedral assemblies of triangular graphite and diamond panels.

**Table 2: Octahedral assemblies of triangular panels**

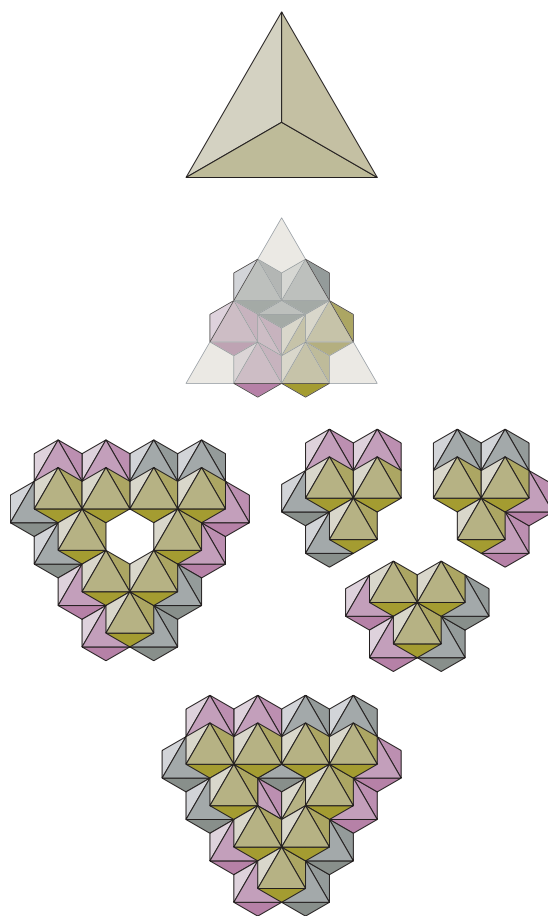
CFUs at edge	CFUs/panel	CFUs/ octahedron	C-atoms/octahedron	
			graphite CFU	diamond CFU
1	1	8	24	32
2	4	32	96	128
3	9	72	216	288
4	16	128	384	512
5	25	200	600	800
6	36	288	864	1152
7	49	392	1176	1568
8	64	512	1536	2048

Figure 1 shows how four graphite CFUs join as the facial panels of a regular tetrahedral assembly.

Figure 2 shows how four diamond CFUs join as the facial panels of a regular tetrahedral assembly.

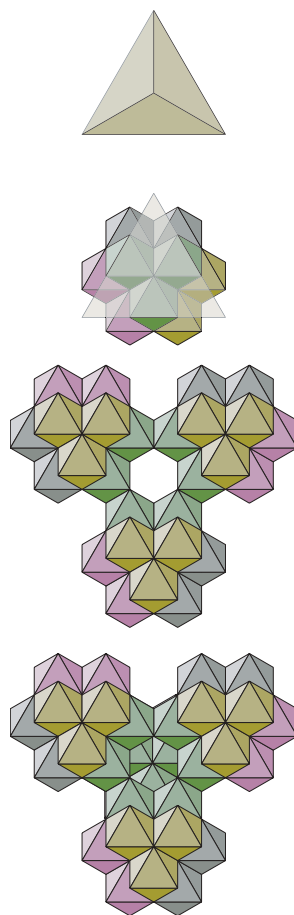
Figure 3 shows how eight graphite CFUs join as the facial panels of a regular octahedral assembly.

Figure 4 shows how eight diamond CFUs join as the facial panels of a regular octahedral assembly.



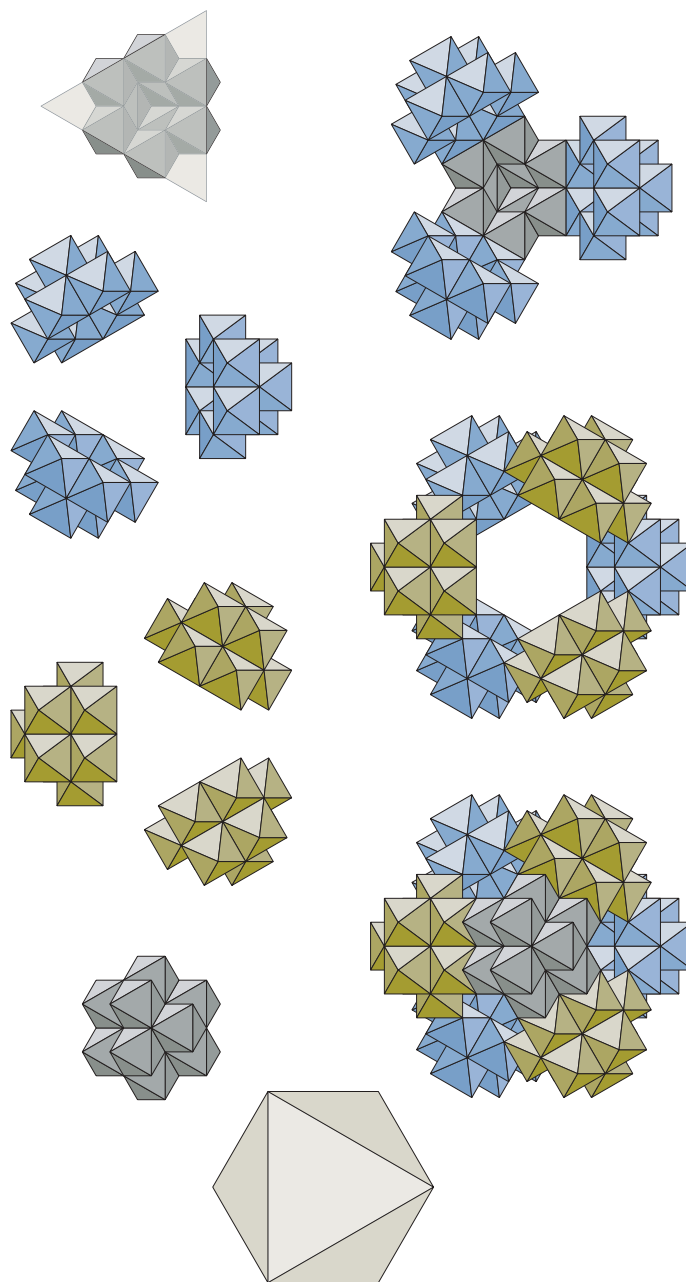
**Fig. 1 Tetrahedron formed of graphite CFUs acting as triangular panels**

The figure shows how four graphite CFUs of three C-atoms each can join in a tetrahedral assembly. The graphite CFU at the top is oriented to serve as the base panel. The three CFUs on the right are oriented to serve as the three upper panels and appear on the left as a structurally stable open faced tetrahedron. At bottom, the base panel has been added to complete the four panel assembly.



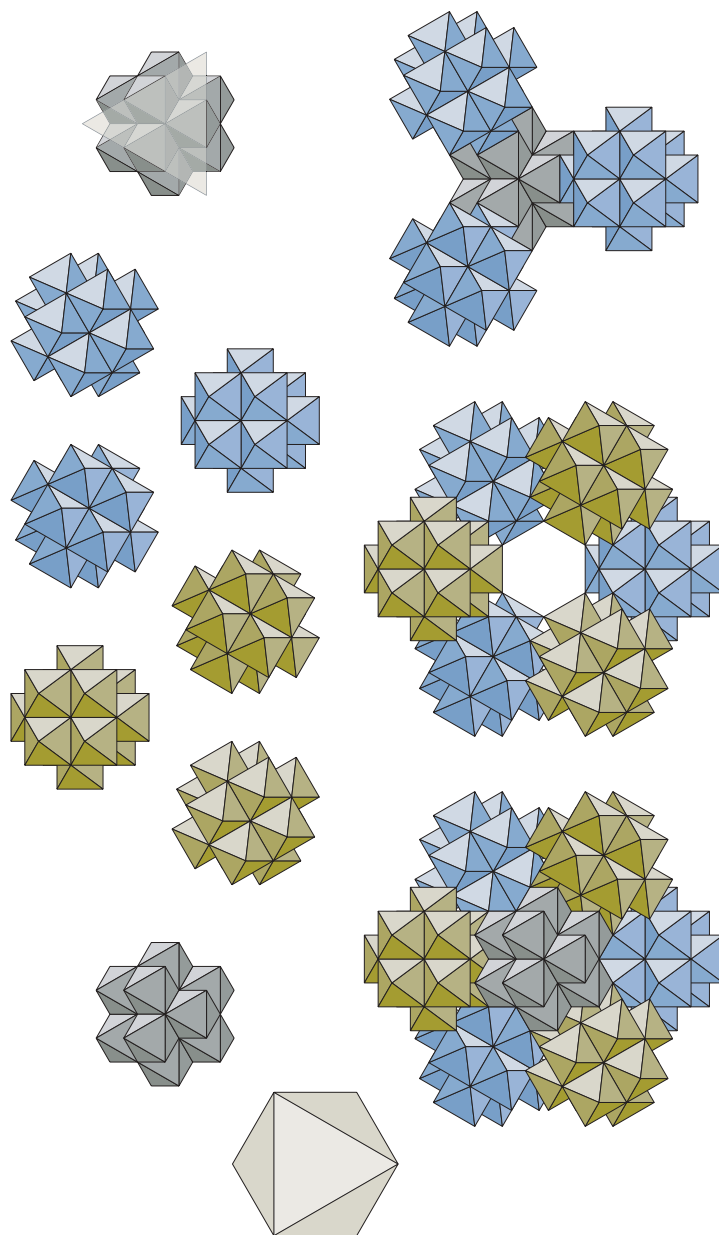
**Fig. 2 Tetrahedral assembly of diamond CFUs**

The figure shows how four diamond CFUs form a tetrahedral assembly. The CFU at the top serves as the base panel. The three joined CFUs in the middle serve as the remaining three panels. This group of three CFUs is structurally stable. At bottom, the base panel completes the tetrahedral assembly.



**Fig. 3 Octahedral assembly of graphite CFUs**

The figure shows how eight graphite CFUs join as a regular octahedral assembly. The eight CFUs are shown on the left in the orientations they have in the assembly. At the top right, the three blue CFUs are joined to the gray CFU which serves as the base. At middle right, the blue and yellow CFUs form a stable assembly which is equivalent to an octahedron less a pair of opposed faces. At bottom right, the octahedral assembly is complete. The internal octahedral volume defined by the planes of the graphite CFU panels is shown at the bottom of the figure.



**Fig. 4 Octahedral assembly of diamond CFUs.**

The figure shows how eight diamond CFUs join as the facial panels of a regular octahedral assembly. The eight CFUs are shown on the left. At the top right, the three blue CFUs are joined to the gray CFU which serves as the base. In the middle right, the blue and yellow CFUs are joined in a structurally stable assembly which is equivalent to an octahedron with two opposed faces removed. At bottom right, the assembly is complete.