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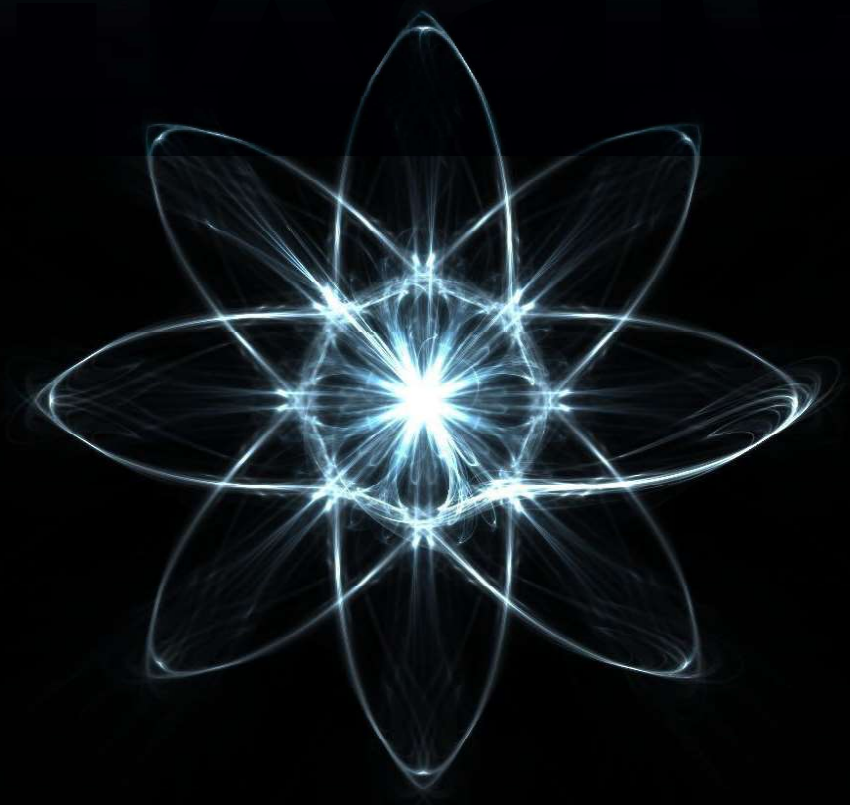

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How to Construct Bc Helix From the Simplest Children's Toy: The Equilateral Triangle

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It is possible to construct BCh from the simplest children's toy: the EQUILATERAL TRIANGLE (ET) available from POLYDRON. They could be connected in DELTAHEDRA (D). All convex D are made only from 4, 6, 8, 10, 12, 14, 16 and 20 ETs.

Starting from any D with one unfilled (empty) triangle (UT) we add consecutively a joined ET pair. The smallest initial D for constructing BCh is so called "boat", made from 7 ETs and one UT. It is the smallest concave D. This UT has vertices with 4, 3 and 2 ETs.

According to Descartes – Euler's law the sum (6 – n) at the top of our BCh is 3+2+1 = 6, since n is 3, 4 and 5. It is the half of the sphere curvature.

Interesting way of constructing BCh appears when we start from 10 ETs: First join 7 ETs in one vertex. Then add 3 ETs to form a vertex with 5 ETs. Now join 2 opposite edges belonging to 5 and 7 borders. The obtained structure is 3d representation of Sigma 7 coincidence grain boundary. It is also a model of the smallest nanotube with one 5–7 defect.

RW, Coxeter-Boerdijk's helix as the smallest nanotube, Biomolecules and Nanostructures 7, 15 – 19 May 2019, Pomlewo near Gdańsk; (Biomolecules and Nanostructures 7 conference organized under the auspices of the Division of Physics in Life Science of the European Physical Society. www.nanofun.edu.pl/bionano7/).