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ARCHITECTURE OF *BRAARUDOSPHAERA BIGELOWII* (COCCOLITHOPHORID): A MARINE PLANKTONIC ALGA WITH QUASICRYSTALLINE SKELETON

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The cysts of golden-brown alga *Braarudosphaera bigelowii*, representing the resting phase with biomineralized Calcite skeleton, display quasicrystalline dodecahedral symmetry[1-3] with radial pentalith suture-intercepts closely matching golden mean ratio: $(\sqrt{5}+1)/2$. Studies under the light- and scanning electron microscope reveal finely laminated nature of each of the 12 regular pentalith plates consisting of microcrystallites of mineral Calcite ($CaCO_3$) with pentagonal rotational symmetry in terms of C-axis orientation of five optically distinct units (Fig. 1).

The dodecahedral cyst of *B. bigelowii*, besides representing one of the most perfectly known Platonic bodies (**Universe**) of ancient mathematicians[4-5], displays quasiperiodic tiling of the three-dimensional space, also known from different organizational level of a variety of biologic entities using vast array of building material, viz., radiolaria (hydrous-silica), coccoliths (biogenic Calcite), pollen-spores (organic polymers)[6-7], viruses (nucleoprotein), including more recent and remarkable quasicrystalloid 5-fold symmetry discovered in Mn-Al alloys, optically condensed matter and all-carbon Buckminsterfullerene molecules[8].

Thermodynamics of quasiperiodic symmetry in living and non-living system has yet to be fully understood, but in case of quasicrystalline micrbiogenic particles invisible to naked eye, the golden mean appears to control the aesthetically harmonizing patterns and forms produced under subdued gravitational force, but major influence of surface tension, Brownian movement and electrical forces.

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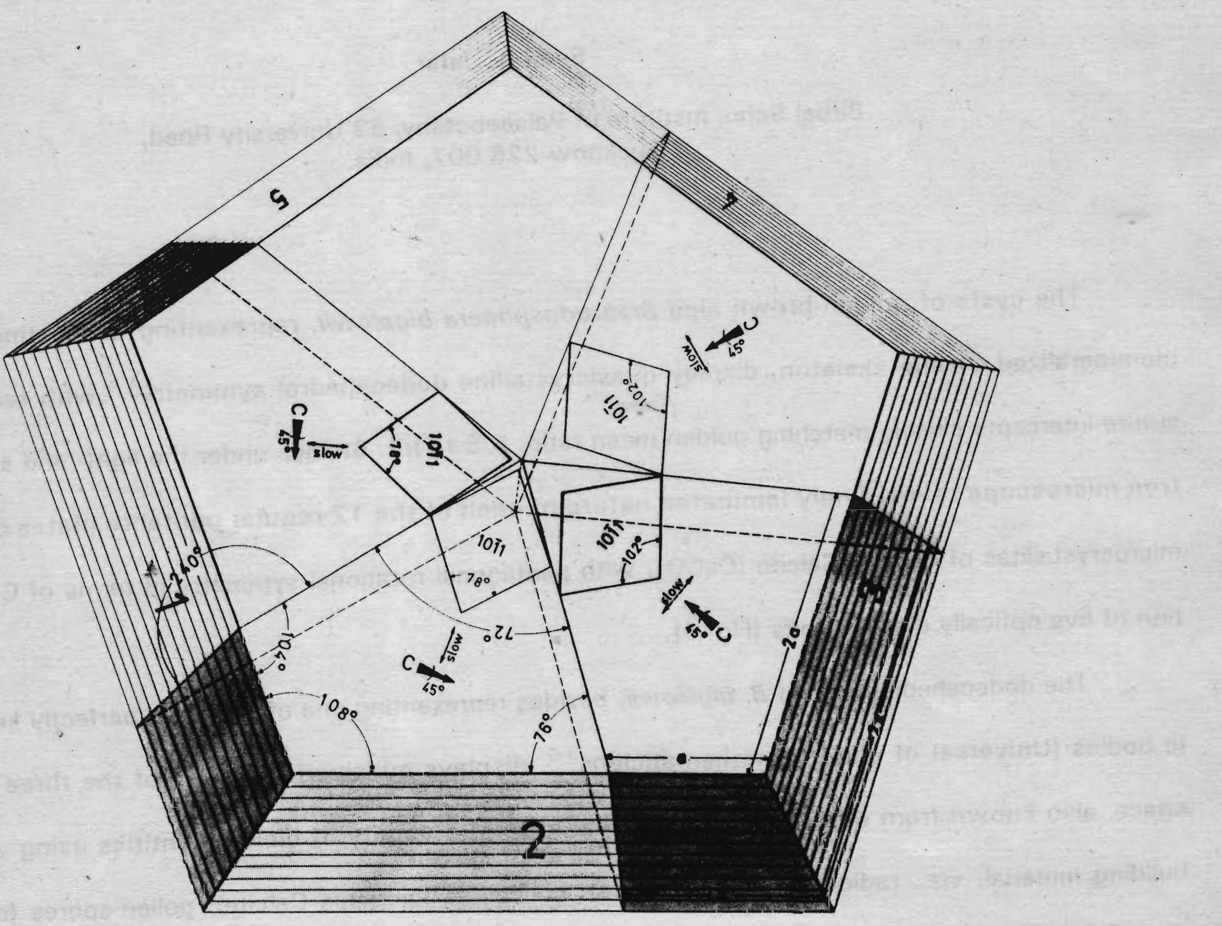

Fig. 1. A model of an isolated pentalith plate of *B. bigelowii* (proximal view, tilted away from observer; diameter ca. 5μ). The most commonly observed optic orientation of Calcite microcrystallites are shown in sectors 1 & 2 and rare one in sectors 3 & 4. The dip and orientation of C-axis is indicated for each pentalith segment behaving as a single Calcite crystal. After initial nucleation of dodecahedral framework, the plates are permitted to grow in thickness only inwards, thus maintaining constant relativity of growth and similar line segment ratios on proximal-distal face (Sector 3; a : 2a = x : 2x).Each of the five polyhedral Calcite units (sectors 1-5) could be conceived as having mutually parallel trapezoidal faces (small proximal and large distal) produced by truncation of a larger Penrose golden rhombus with angles of 108° - 72°.