The Seven Principles of Angle Stitching -- a Geometrically Based Beading Technique

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Abstract

I describe the requirements for a threaded beadwork technique that I call Angle stitching. The technique relies on geometric nets to form an infinite possibility of patterns and forms in two and three-dimensions.

What is Angle Stitching?

Angle Stitching is a burgeoning new area of beadwork that includes a family of beadwork stitches in which the thread operates in a consistent manner and places beads at recognizable and repeatable angles within the work. Different discrete stitches within the family are right-angle stitch, triangle stitch and hexagonal stitch. In addition to creating flat two-dimensional "fabrics", right-angle and triangle stitch will form three-dimensional polyhedra such as cubes, tetrahedra, octahedra and icosahedra. Three-dimensional forms of hexagonal stitch are truncated icosahedra (where the pentagonal faces would be "decreases" in beading terms) and truncated tetrahedra (the "decreases" are the triangular faces). Because the Archimedean solids include two or more polygon faces I find it simpler to describe them as Angle stitching without having to name each polygon, polyhedron or angle involved.

Off-loom beadwork encompasses beading worked and held in the hands (not on looms) that connects beads by means of thread with or without needles or other mechanical aids. Angle stitching is a more complex form of netting. Netting will fall apart if cut and scatters beads everywhere. Angle stitching, which requires more passes of thread through each bead, will barely lose a bead when cut.

David Chatt, a prominent bead artist, pioneered right-angle stitch, working out a single-thread path alternative to the more traditional multi-thread technique. His first published directions for single-needle right-angle stitch appeared in *Beaded Amulet Purses* [1] published in 1994. During a weeklong master class with Chatt in 1997 I began experimenting with triangle stitch. I refined and created working directions for the stitch. The experience lit a fire in my creativity and set me on a different direction in beadwork toward more consciously exploring the conjunction of beadwork and geometry. In 1999 I labeled this new beadwork Angle Stitching.

To qualify as a recognized "stitch", a beadwork operation must perform in a number of ways. One must be able to work the stitch horizontally, vertically, diagonally, in the round, and in layers. The stitch must increase and decrease the beadwork at any edge and from within the work. A beader must be able to create three-dimensional forms through means of increasing, decreasing or adding a layer. The stitch should be able to connect to a completely different stitch. Angle stitching performs all of these functions.

Seven Principles of Angle Stitching

There are seven principles active in Angle Stitching that support beadworking on two-dimensional and three-dimensional levels and fulfill the requirements to operate as and be called a beading stitch.

1st Principle: Beads represent the lines of a polygon shape, the lines of the interior angle of a polygon or the edges of a framework or skeletal polyhedron. The lines and edges can each be one or more beads. We measure the length of the lines or edges in "bead units" (the number of beads in a single line or edge). The diagram in Figure 1 looks different from the single circular thread loop photo of actual beads. See Figure 1.

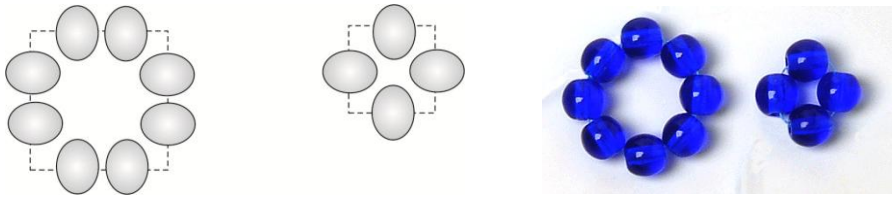

Figure 1: *The "squares" on the left have 4 bead units of two beads each. The interior angles (cross) of the "squares" on the right have a bead unit of a single bead.*

2nd Principle: Each circular thread loop of bead units represents an open frame polygon face. The beads delineate the outside, framework or skeleton of the polygon with the face remaining empty of beads. The number of bead units required for any one shape equals the number of the sides of the polygon. See Figure 2.

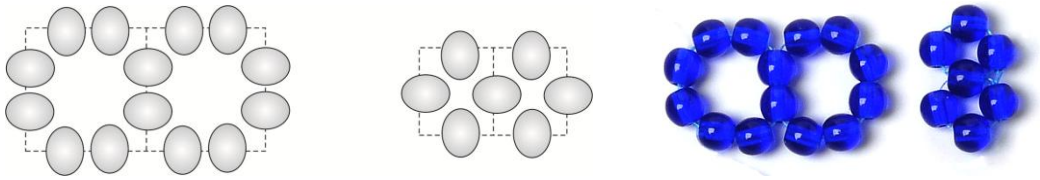

Figure 2: *Two thread loops of bead units (two beads on left and one bead on right.)*

3rd Principle: Each circular thread loop of bead units shares only one line/edge/bead unit at a time with another circular thread loop to form a series of open frame polygons. As the surrounding polygons form, the resulting tension will pull the bead unit circular loop into the shape of the intended polygon. See Figure 3.

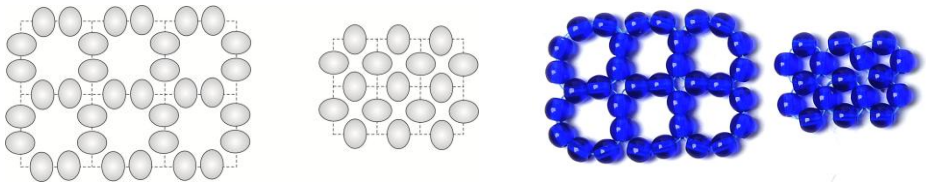

Figure 3: *Bead diagrams and samples show multiple polygon shape open frames. The larger the number of thread loop units the greater the thread tension which pulls the polygons into shape.*

4th Principle: A thread path connects each of the circular loops of beads (open frame polygons) so that what would be the vertex or intersection of lines or edges of the open frame polygons or polyhedra become an empty space or "void" surrounded by thread and beads. See Figure 4.

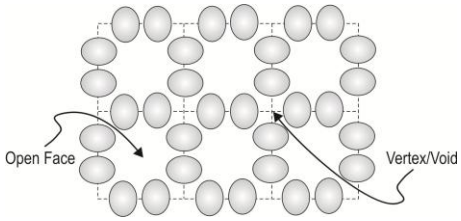

Figure 4: *Arrows point to the vertex/void and open face. The dotted lines represent the implied line of the polygon and not the thread path.*

5th Principle: Three or more bead units lie around the "void" (vertex where the polygon lines or polyhedron edges meet) at recognizable and repeatable angles. Bead units of one bead form the interior angle of the polygon. Two-dimensionally, the bead units create the outline of the polygon (bead unit of two or more beads) or the central/internal angle of the polygon (bead unit of one bead). Three-dimensionally, the bead units create an open frame or skeleton of the polygon face of a polyhedron. No other bead stitch operates in this way. See Figure 5.

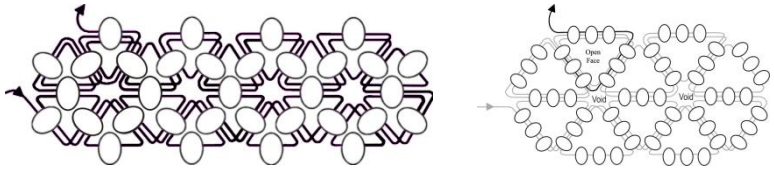

Figure 5: *Triangle stitch. Diagram on left is a bead unit of one. Diagram on right is a bead unit of three.*

6th Principle: An angle stitch repeats the main polygon units or combination of units (one or more different polygons that tile the two-dimensional plane or that come together as Platonic, Archimedean or other three-dimensional open framework polyhedra or skeleton forms). See Figure 6a and b.

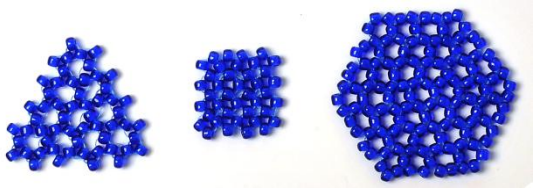

Figure 6a: *Regular tilings, triangle, right-angle, hexagonal; bead units of one.*

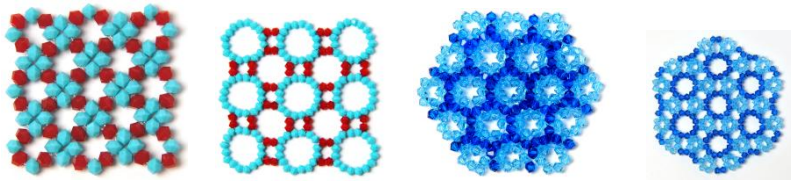

Figure 6b: *Semi-regular tilings, bead units of one and two.*

7th Principle: In single-needle angle stitching the thread follows a spiral path. Two-dimensional stitches alternate clockwise and counterclockwise spiral loops every other stitch. Three-dimensional angle stitching follows one continuous spiral. The chirality of the spiral in three-dimensional work depends on how the pattern began (and possibly the "handedness" of the beader). See Figure 7.

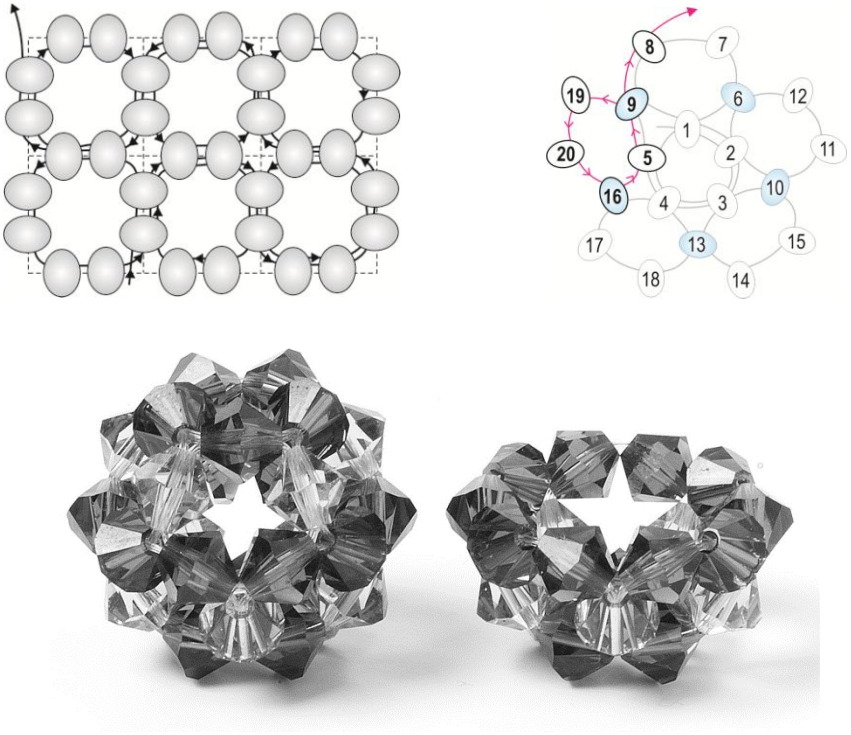

Figure 7: *Top image on left shows alternating counterclockwise and clockwise thread path for right-angle stitch. Top image on right shows continuous spiral thread path for first five steps (pentagons) of a dodecahedron.[2] Lower photo of full and half bead dodecahedra.*

Conclusion

These seven principles of Angle Stitching create a vast number of beaded variations of geometric nets, tilings and polyhedra. The branches of this family of stitches are a rich source of a new frontier in beading exploration. We have only examined the requirements for the thread and bead mechanics of the stitch. Adding in color patterning, using beads of different materials, and manipulating geometric forms with different sizes of beads leads to an even greater galaxy of beaded forms.

References

[1] Nicolette Stessin, *Beaded Amulet Purses*, Beadworld Publishing, 1994.

[2] Laura Shea, The Plato Bead: A Bead Dodecahedron, Workshop, Bridges Conference Proceedings, London 2006.