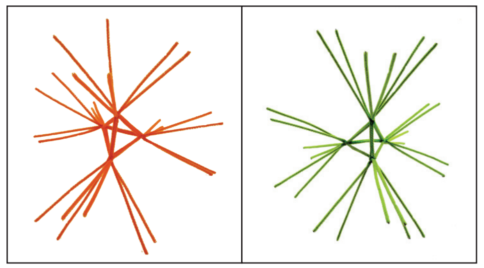
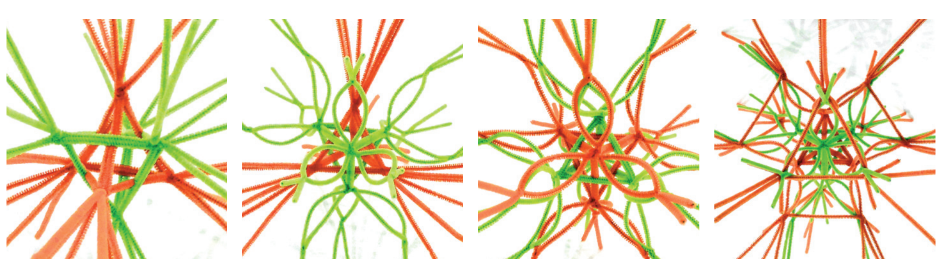
A Description of the Algorithmic Recipe for the Second Pipe Cleaner Sculpture

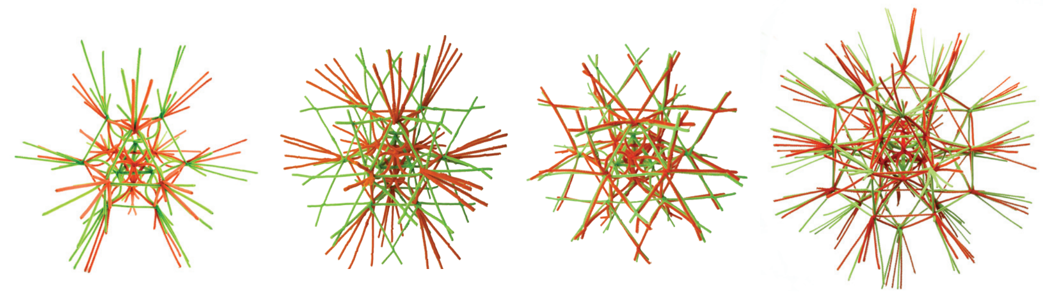
(Also available in the catalog and at momath.org)



So, as we say, this sculpture began with two tetrahedrons—one fashioned out of orange pipe cleaners, the other out of green—the two of them crisscrossed inside each other such that the vertices of one poked out the faces of the other, like a three-dimensional Star of David. A cluster of six pipe cleaners sprouted from each vertex of both tetrahedrons, orange ones from the orange tetrahedron, and green from the other.

The next step the Twins contrived involved uniting some orange and some green together in a new set of vertices one layer out. This was done by bending three flower-petal-like shapes out of the six pipe cleaners sprouting from each vertex, which caused them to disperse in pairs towards new vertices where it just so happened the tip of each orange flower petal neatly rubbed up against the tip of a green flower petal. Now, with two orange and two green pipe cleaners at each new vertex, additional pipe cleaners were added to connect the vertices. The middle of each "connector" pipe cleaner was planted in such a way that its two ends could be twisted onto each of the two vertices it connected, creating a cluster of four green and four orange at each vertex.





From this point forward, just as with the earlier ruffling pipe cleaner sculpture, a localized building rule—an algorithmic procedure that could be performed identically at every connector—was devised, one that is always only two steps long: 1. Join matching colored pipe cleaners from the two vertices separated by a connector into an equilateral triangle above the connector. This creates a new set of twice as many vertices one layer out, with two orange and two green at each vertex. 2: Add connectors in the manner specified above. This brings the arrangement back to where it started, with four green and four orange at each vertex, but now with twice the vertices and twice the connectors as the previous layer. Because the local arrangement at each vertex is exactly the same as before, the building procedure can now be repeated—this time at twice as many sites—which in turn will produce yet another set of double the vertices one layer further out. And so forth...

You can keep repeating the procedure in cycles one after the other forever, or at least until the physical limit determined by the width of the pipe cleaner is reached. As with the first sculpture, this cyclical pattern creates a self-similar fractal structure, compounding by way of a network of pipe cleaners that smoothly multiplies as it grows outward, in this instance not into hyperbolic negative curvature but rather in fact into the *opposite* of negative curvature, which is to say, toward a spherical form.