

1036-51-30

CJ Fearnley* (cjf@CJFearnley.com), 240 Copley Road, Upper Darby, PA 19082-4016.

Explorations to define a Theory of Foldable Great Circle Origami. Preliminary report.

In the folklore of R. Buckminster Fuller's Synergetics, the great circle "railroad tracks" transit "energy" inwardly and outwardly through the center of a sphere or omni-directionally around the great circles or to other inter-connected systems. Fuller illustrated these ideas with models built by folding unit circle modules into spherical cones that exactly dovetail to generate great circle tessellations of the sphere. These tangible models show whole planar great circles (not just the surface graph) and the relationships between angle, volume, and the spherical nets.

We observe that not all great circle nets can be partitioned into unit Eulerian circuits (the modules) with exactly 360° of arc and therefore cannot be folded as elegantly as some of Fuller's examples. Then we describe our investigation to mathematically characterize great circle foldability: to define the surprising relationships between local behavior (unit circle modules) and global structure (great circle nets). Our preliminary results suggest that the fundamental theorem of the foldability of great circle nets may be related to Fuller's "equators of spin" defined by (diametrically opposite) topological elements as poles (vertexes, mid-points of edges, and "centers" of faces). (Received November 27, 2007)