

A Systematic Approach to Twirls Design

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Ten years ago Herman van Goubergen used spirals to join modules and described his Curler Unit from twisted waterbomb base. The authors have developed this idea since then and they have designed the wide family of models with spirals called Twirls. They have discovered that a spirals system is as powerful as a flap-and-pocket system and have started to analyze a structure of modules with spirals and polyhedral structure of Twirls models.

A basic module has a structural part (flaps connecting modules in form of spirals or flap-and-pocket) and an ornamental part. Both parts of a module open many possibilities. Very often a small variation of a basic module produces new significant visual effects.

Basic module design is based on the following options: shape of the paper (squares, triangles, pentagons, rectangles, rhombuses, etc.), number and location of flaps, shapes of flaps (twisted, folded or straight flap), modifications of the ornamental part. The authors describe three general classes of twirls modules: spirals/flaps around a point, spirals/flaps at ends of a line, spirals/flaps at vertices of a polygon.

A final twirl model is determined by a design of a basic module and a polyhedral structure. Twirl modules may be used as: vertex modules – corresponding to a vertex in a polyhedral structure of a model, edge modules – corresponding to an edge in a polyhedral structure of a model, face modules – corresponding to a face in a polyhedral structure of a model, elements to build macro-modules corresponding to polygons.

The authors discovered also that: it is possible to mix a spiral system with others systems of joining modules, there are twirl modules without any folds, one or two folds, a macro-module system is useful in creating new forms and testing new possibilities. The structural approach constitutes a framework for design of new twirl models



Figure 1: Examples of Twirls: a snub dodecahedron, no-crease modules (left); a truncated icosahedron, different shape of spirals (center); a tetrahedron, macro-modular, spirals' and flap-and-pockets' mixed system (right)