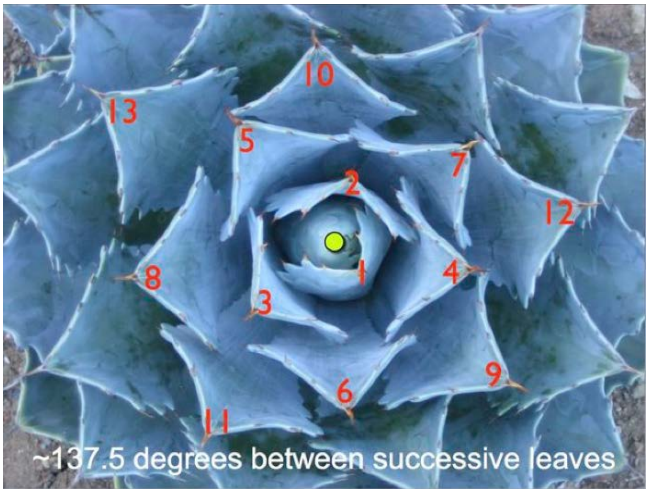
The Secret Behind Lollipopter's Magic

How the magic of Lollipopter relates to nature, math and physics

The Lollipopter's transforming shape is based on a very specific ***phyllotaxy*** (i.e. leaf order) used by nature in a number of botanical forms, including pinecones, pineapples, sunflowers, artichokes, palm trees, and many succulents.



The photo on the left shows just such a succulent. The leaves are numbered from youngest to oldest. If you follow the numbers in sequence you will find that each leaf is approximately 137.5º counter-clockwise around the core from the previous leaf.

137.5º is a very special angle, called the ***Golden Angle***, based on the ***Golden Ratio***. When that angle is used by nature as a growth strategy it leads to the formation of spiral patterns. If you were to count the number of spirals in these patterns you would find that they are always numbers in the ***Fibonacci Sequence*** (i.e. 1, 1, 2, 3, 5, 8, 13, 21, 34…). The two most obvious spirals will always be adjacent numbers in the Fibonacci sequence, and will always spiral in opposite directions.

You can see this in the photo on the right where the pinecone has 8 spirals going clockwise, and 13 spirals going counter-clockwise.

The positions of the petals on the Lollipopter - when in the pinecone-like formation - is also based on the golden angle. But because the Lollipopter has two petals on each arm, the angle between neighboring arms is ½ the golden angle, or 68.75º. As a result of this, the numbers of spirals on the Lollipopter are doubles of Fibonacci numbers, specifically, 6 & 10 (2 x 3 & 2 x 5).

When the Lollipopter is in the helical formation, the angle between neighboring arms is 3º. Through the use of internal stops (pegs and slots), each arm is constrained to rotate a maximum of 71.75º (68.75º + 3º) relative to its neighbor. The only arm that doesn't rotate is the bottom one, which is fixed to the center column. When you start the Lollipopter spinning and then hold it still, momentum keeps each arm spinning until it reaches the internal stop. The stopping process begins when the bottom stationary arm stops the second arm, which then stops the third arm, and so on all the way to the top.

Now you know the math and physics behind the magic of the Lollipopter!