

## Knot geometry

Knots, they are all around us. They tie up our everyday life, they are a structure studied by mathematicians, and they create surprising elegant patterns in space too.

As the first part of 52-flower project ended the last week of December 2019, I'll be continuing my exploration of mathematical shapes and focus on knots this year.

Knots are tangible, yet they often create very complex abstract shapes. In mathematics, a knot is defined as a closed, non-self-intersecting curve that is embedded in three dimensions and cannot be untangled to produce a simple loop ([Weisstein, 2019](#))

250 prime knots with ten or fewer crossings, 1,701,936 prime knots (including the unknot) with up to 16 crossings according to [Jim Hoste, Jeff Weeks, and Morwen Thistlethwaite](#), that's a lot of knots to choose from, not counting composite or hyper knots.

I studied knots before in the 12-30 project, month of June @<http://bit.ly/12-30project> Part of a research on mathematical visualization software, I explored 30 among the many to choose from and from a very technical perspective. This time, I'll want to anchor my project in reality and add elements of space and time into it.

According to cartographers, the earth circumference is 24,901 miles, approximately 21,000 nautical knots. Starting at latitude 0, longitude 0, I'll sail an average of 400 (nautical) knots a week to fully cover its circumference in 52 weeks, 1 (mathematical) knot a week, and visit places and cultures I didn't know existed. That should give me plenty of background inspiration in addition to interpreting visually the structure of a different mathematical knot each week (Fig.1).



Figure 1. 52 (mathematical) knots a year following the equator line.

To get a livelier sense of what I was getting into, I based my journey on the 15th century Ortelius map (Fig.2). A good fit, I believe. Like my calculation, the accuracy of the mapping is tentative at best. Furthermore, there is as much to discover in the world today as it was then.



Figure 1: 52-week journey map.

Following the equator line in broad strokes will give me a simple framework and provide valuable and consistent external resources, depending where I'll be at any particular time each week, be it lost in the abstract nature of the ocean or fascinated by the many rich cultures I'll be crossing in my journey around the planet.

I'm already wondering what kind of knot resonates best in the Galapagos Nature refuges, which one is revered in Kiribati, Quito, Kampala or Kiribati.

I'll be setting sail westward from latitude 0° longitude 0° at 00.01 am GMT (or UT1 for some) on Sunday January 5th and in the tradition of the 16th century Spanish explorers will be moving West toward the Americas. I'll post new information every Sunday thereafter.

Starting next Sunday, being on the ocean for the next 11 weeks or so, the wind will be my main cultural resource. A feast of abstract strands to work from, thanks in no small part to a real-time Earth wind map available at <https://earth.nullschool.net/> (Fig. 2).

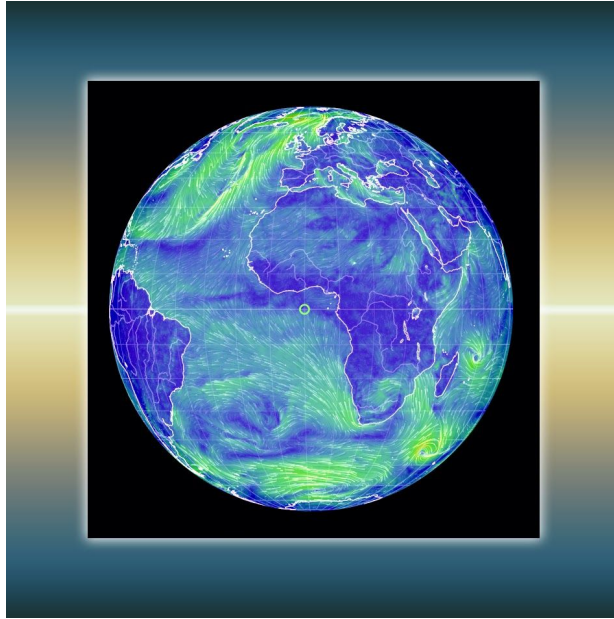


Figure 2. World wind map, Dec. 31: Latitude  $0^\circ$ , Longitude  $0^\circ$

But first, to celebrate the beginning of this series, I'll honor the imagination of the US, French, and Brazilian scientists that monitor and maintain the station.

Having a healthy sense of humor on top of their technical competence, they instigated the creation of a virtual but very real island on this geographical spot. The lone buoy about 380 miles south of Ghana and 670 miles west of Gabon goes by the name of Null, which also happens to be the word associated with the beginning and ultimate representation of the knot theory.

Since its creation, the "island" of Null has been given its own geography, flag, and history. Appropriately, I'll use a variation of its color theme for my banner and start my very first knot by celebrating the island flag, a simple un-knotted closed loop on an orange, grey, and blue background.

I'll publish on social media platforms (Facebook, Instagram, Twitter) a recap of my weekly visual, but I'll keep all the in depth background notes, sketches and other material on Patreon hoping that aside from enjoying my work, it can motivate, inform, and entertain some of you that will come along and follow my adventures in this fun and unusual journey.

Jean Constant  
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