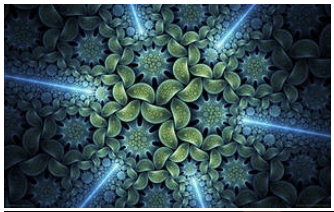
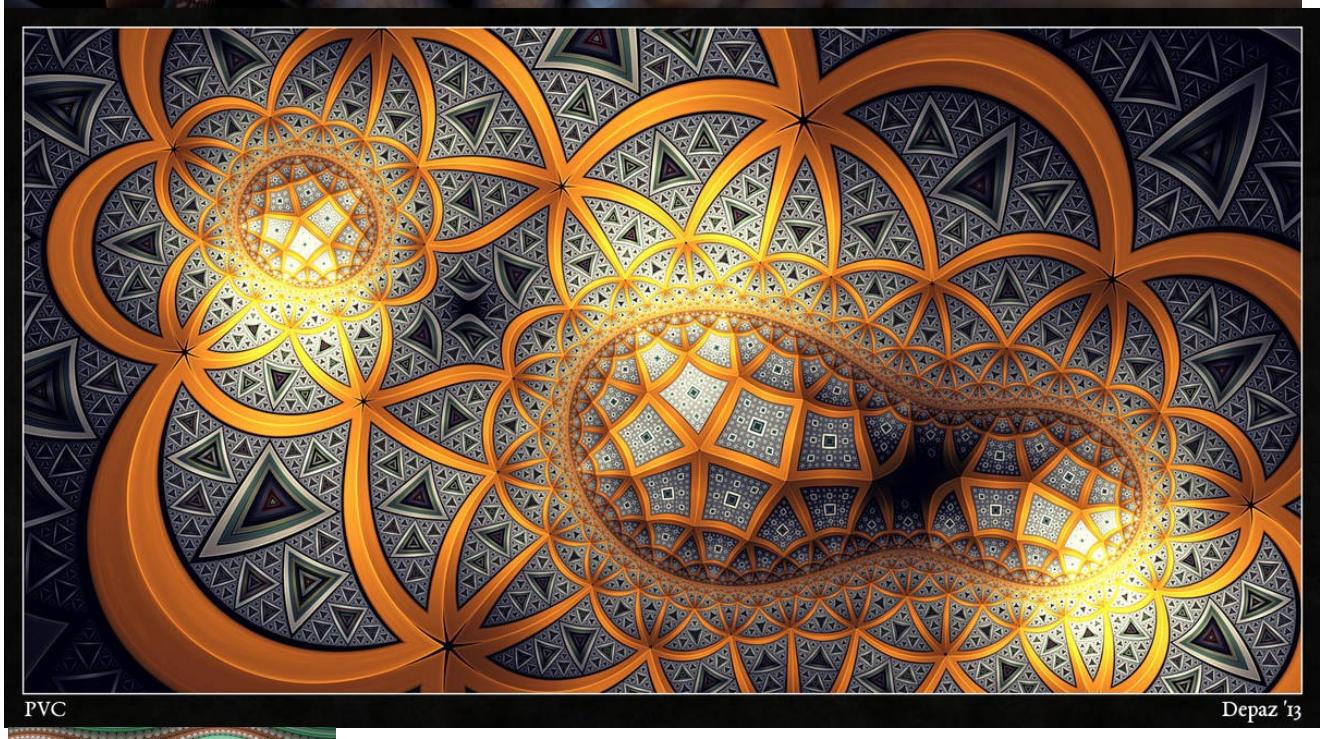
Hypertile Basics by tatasz on DeviantArt

First of all, special thanks to Zueuk who had the patience to explain me all the hypertile stuff
There is also an awesome hypertile tutorial that you should check out first: Hypertile Uncovered With 3D

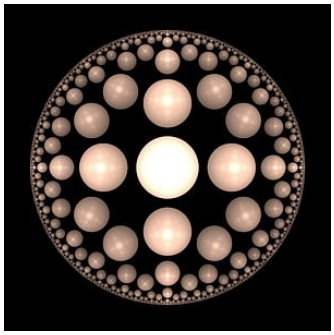




Basics

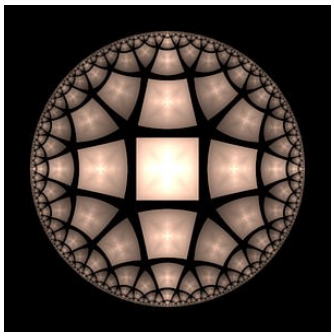
To make a basic hypertile, you will need 2 transforms: Basic hypertile

- hypertile2, rotated 180 degrees
- bubble (small amount, about 0.25 lets say) with pre_blur



The exact bubble size to fill a hypertile can be calculated exactly, or you can just change the amount of bubble until it fits.

The hypertile has two parameters, p and q. Basically, this means it takes p-gons, with q polygons meeting at each vertex (this doesn´t means you must fill a hypertile with p-gons, just that its the "basic" element). Below, i replaced the bubbles of the first example (p=4 and q=5) with squares:

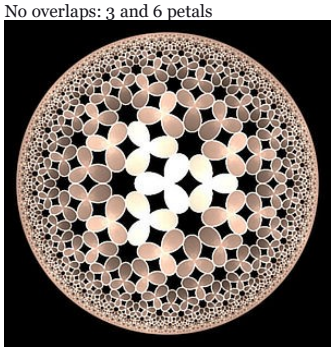
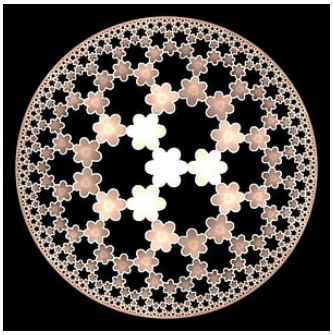


Symmetry

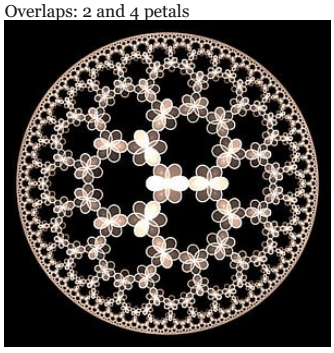
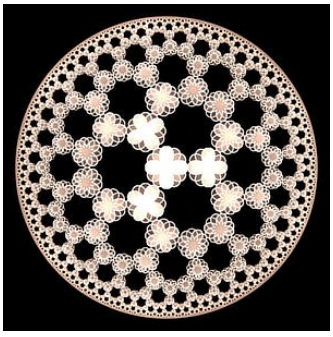
The central tile in the hypertile must have rotational symmetry of order p. For example, you can fill a hypertile with p=3 with a triangle (symmetry of order 3) or a hex (symmetry of order 6, so also symmetry of order 3), but if you try using a square (symmetry of order 4), it will produce artifacts and overlaps.

Below, a hypertile with with p=3 and q=7.

No overlaps: 3 and 6 petals

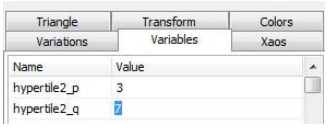
Overlaps: 2 and 4 petals

In this example, overlaps actually look pretty cool, but they will break the pattern you are trying to put into the hypertile if the p parameter doesn´t match the symmetry of your pattern. Also, you need a symmetrical or near symmetrical pattern to fit in.

Other Maths

The hypertile plugin has 2 parameters, p and q:



It will only work properly if 1/p+1/q < 0.5. Só a hypertile with p=3 and q=7 is possible, because 1/3+1/7=0.476, but a hypertile with p=3 and q=6 is not, because 1/3+2/3=0.5.

Now, lets see how to calculate the exact bubble size for a hypertile. I strongly recommend that you take a look at the two articles below, as i will give only a short formula:

- www.malinc.se/math/noneuclidea...
- moniker.name/worldmaking/?p=38...

So, to get the bubble size **b**, you need to do the following:

- c = cos(pi / q)
- s = sin(pi / p)
- d = 1 / sqrt(1 - ((s * s) / (c * c)))
- r = 1 / sqrt(((c * c) / (s * s)) - 1)
- b=d - r

For example, for p=3 and q=7, we have:

- c = 0.900969
- s = 0.866025
- d = 3.625845
- r = 3.485219
- b = 0.140626

Indeed, if we set bubble to 0.140626, it looks just perfectly fitted: Hypertile with perfect fit