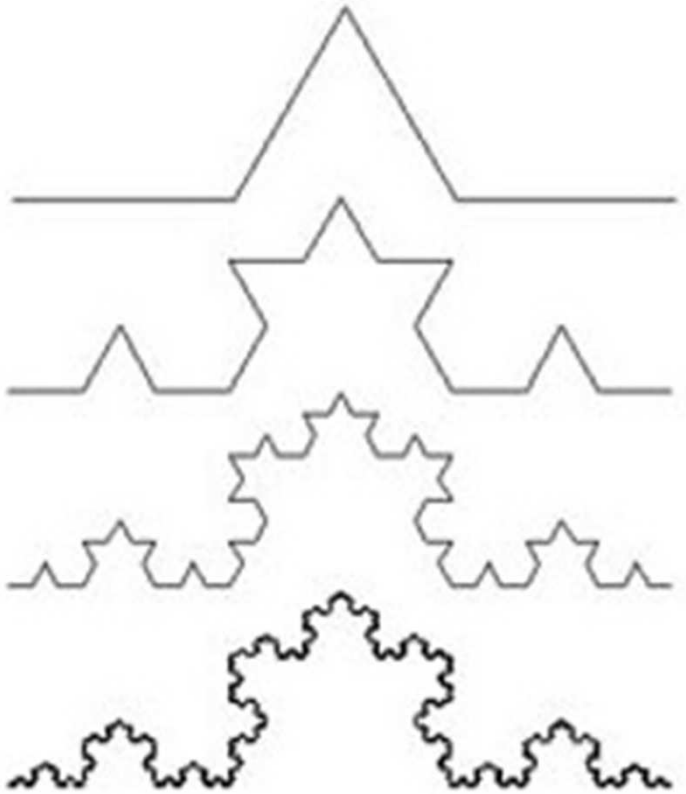
Fractals

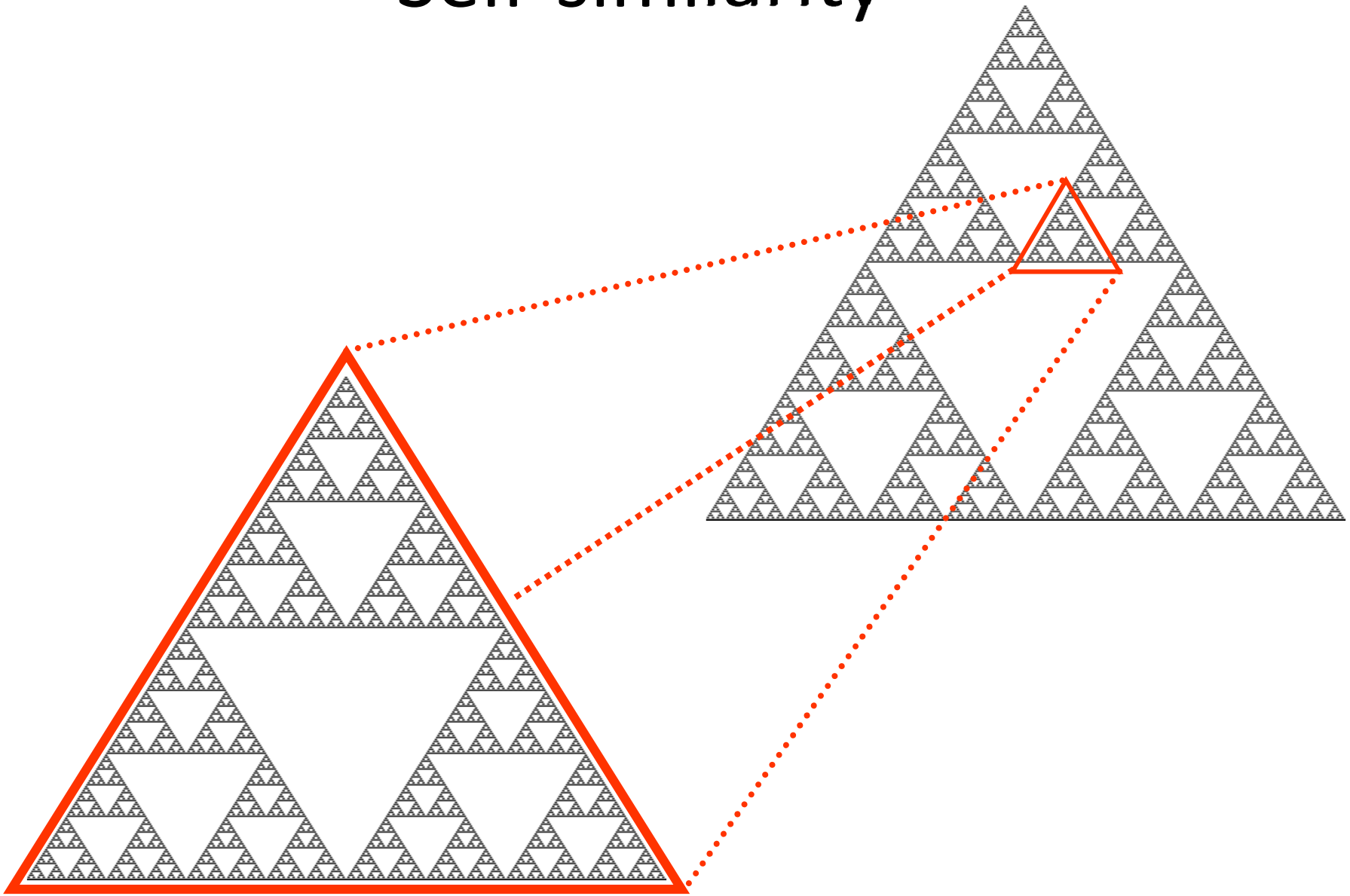
C. Andújar

June 2014

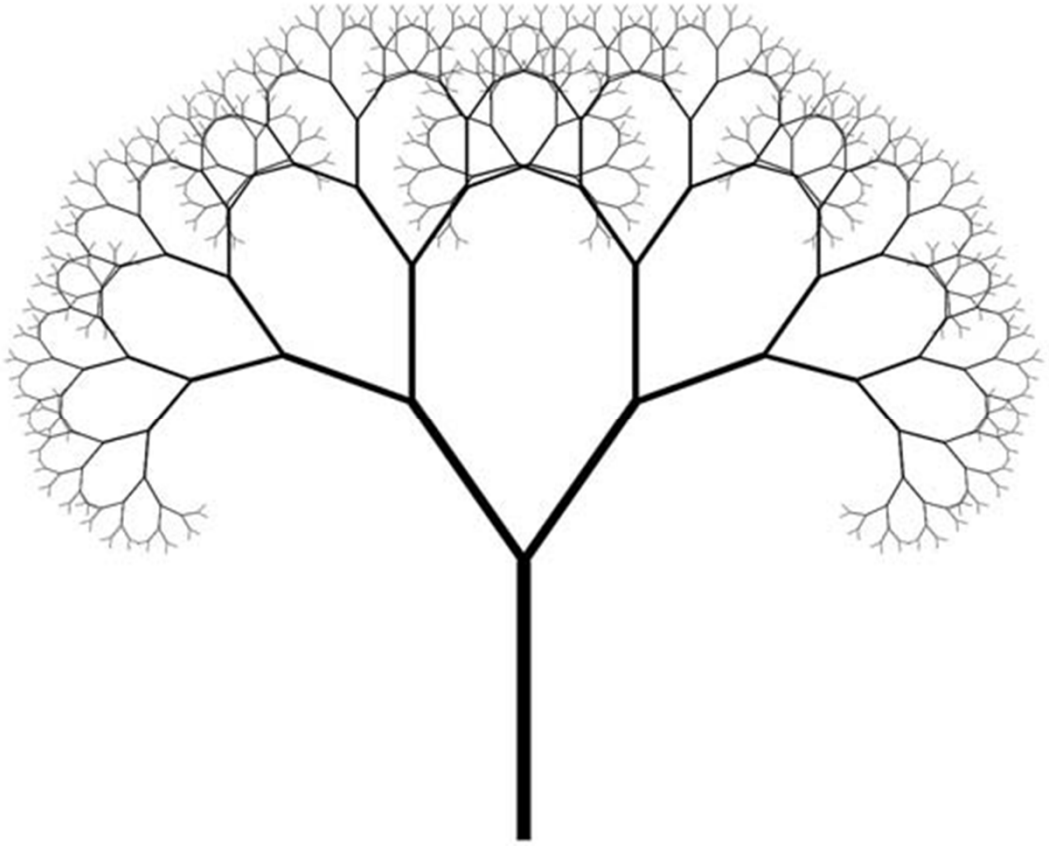
Self-similarity



Self-similarity

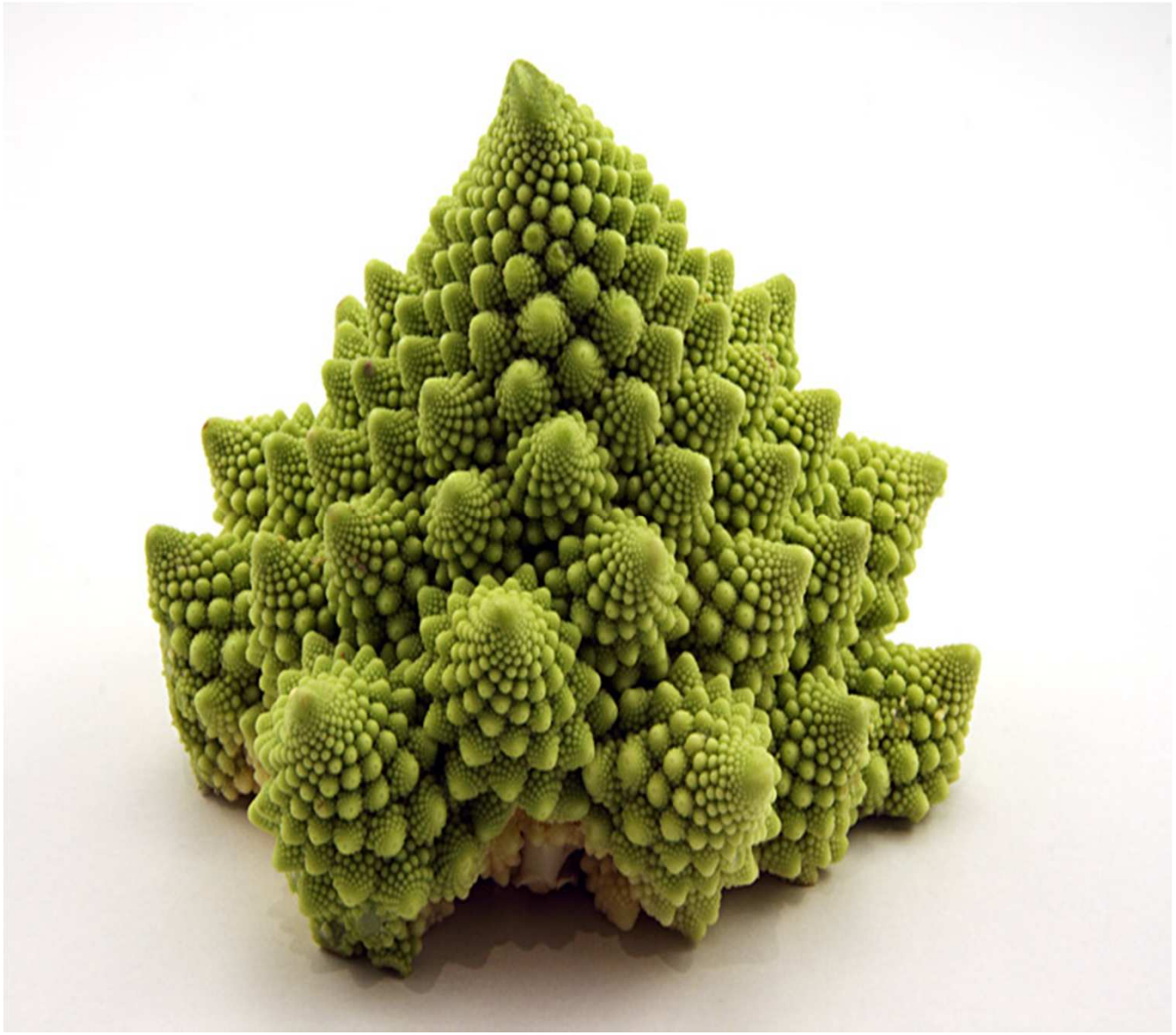


Self-similarity



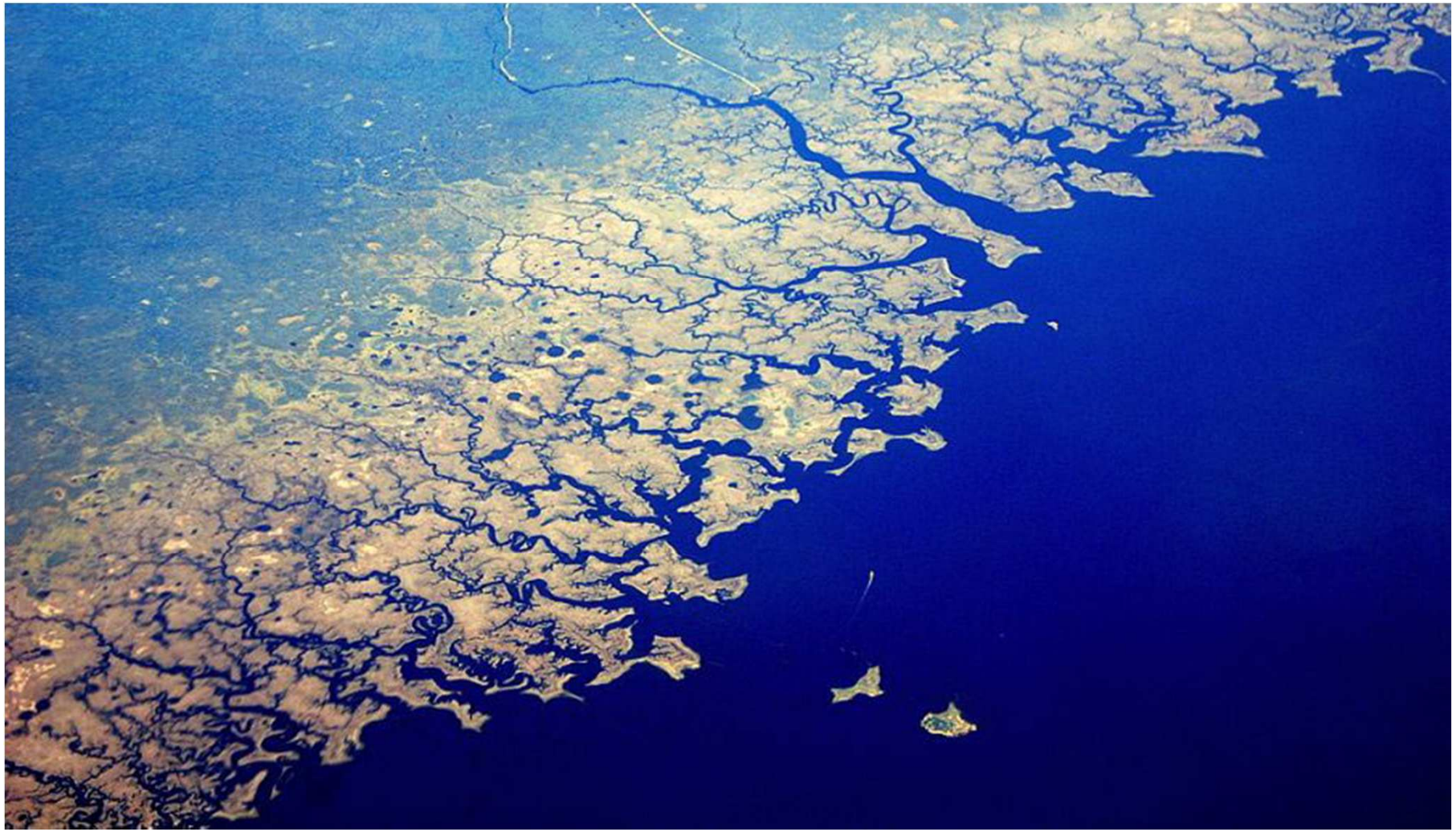
Self-similarity

Self-similarity

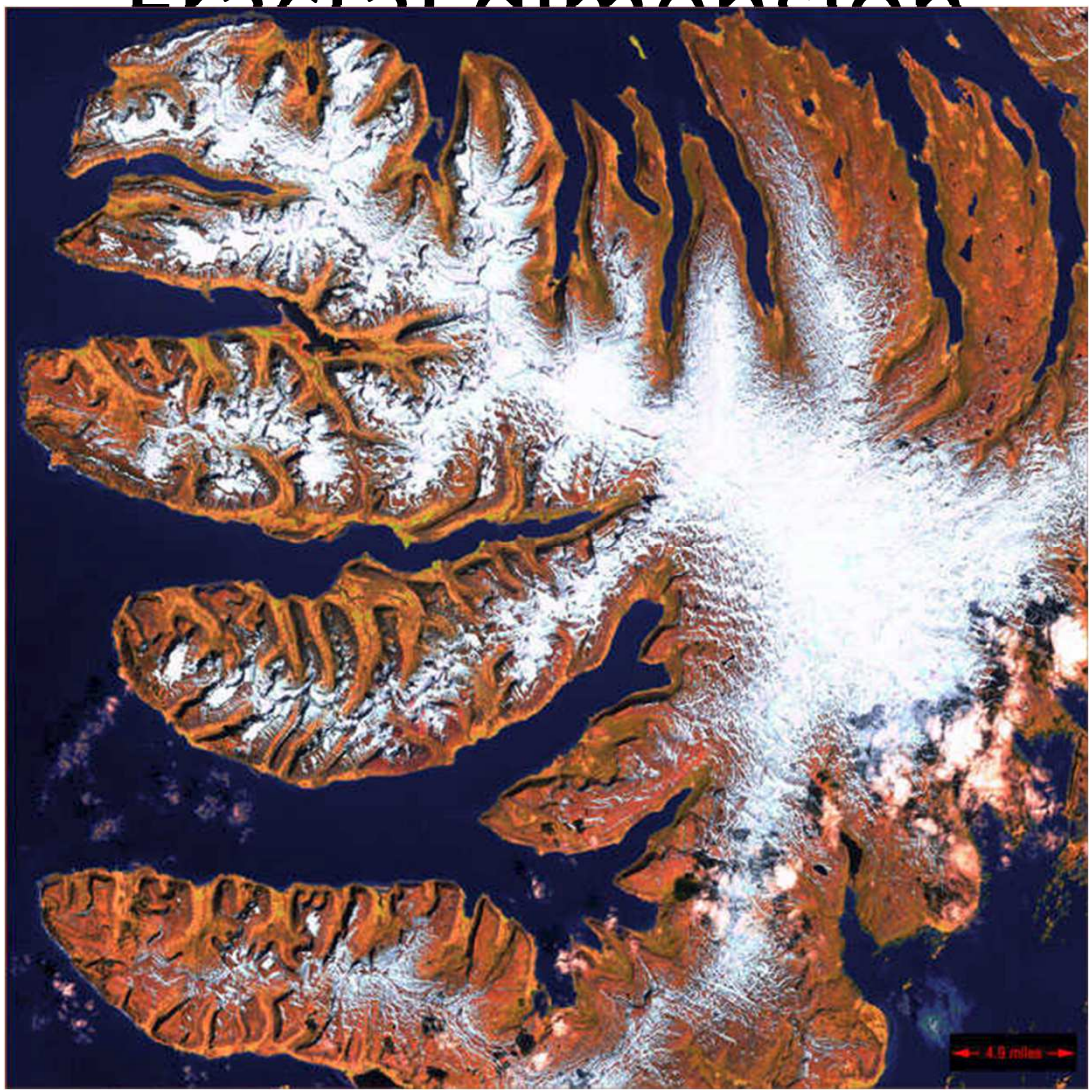


Self-similarity

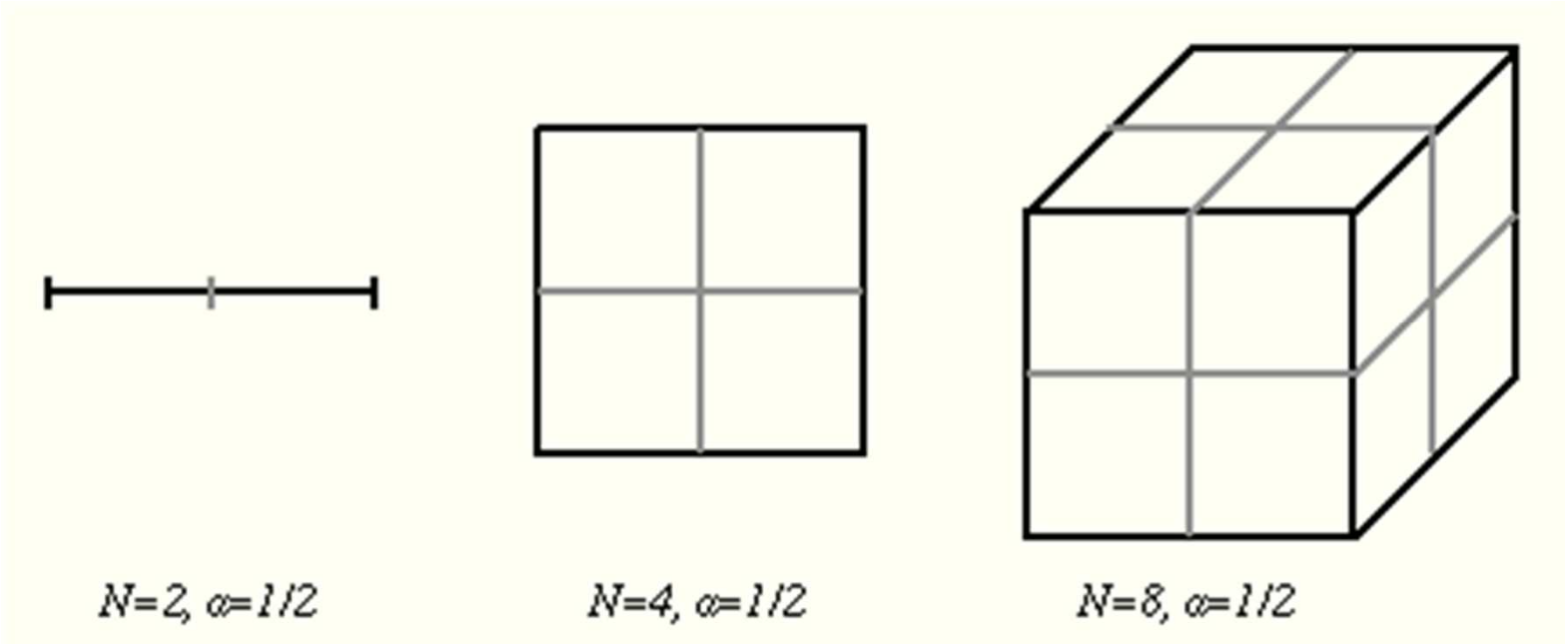
Fractal dimension



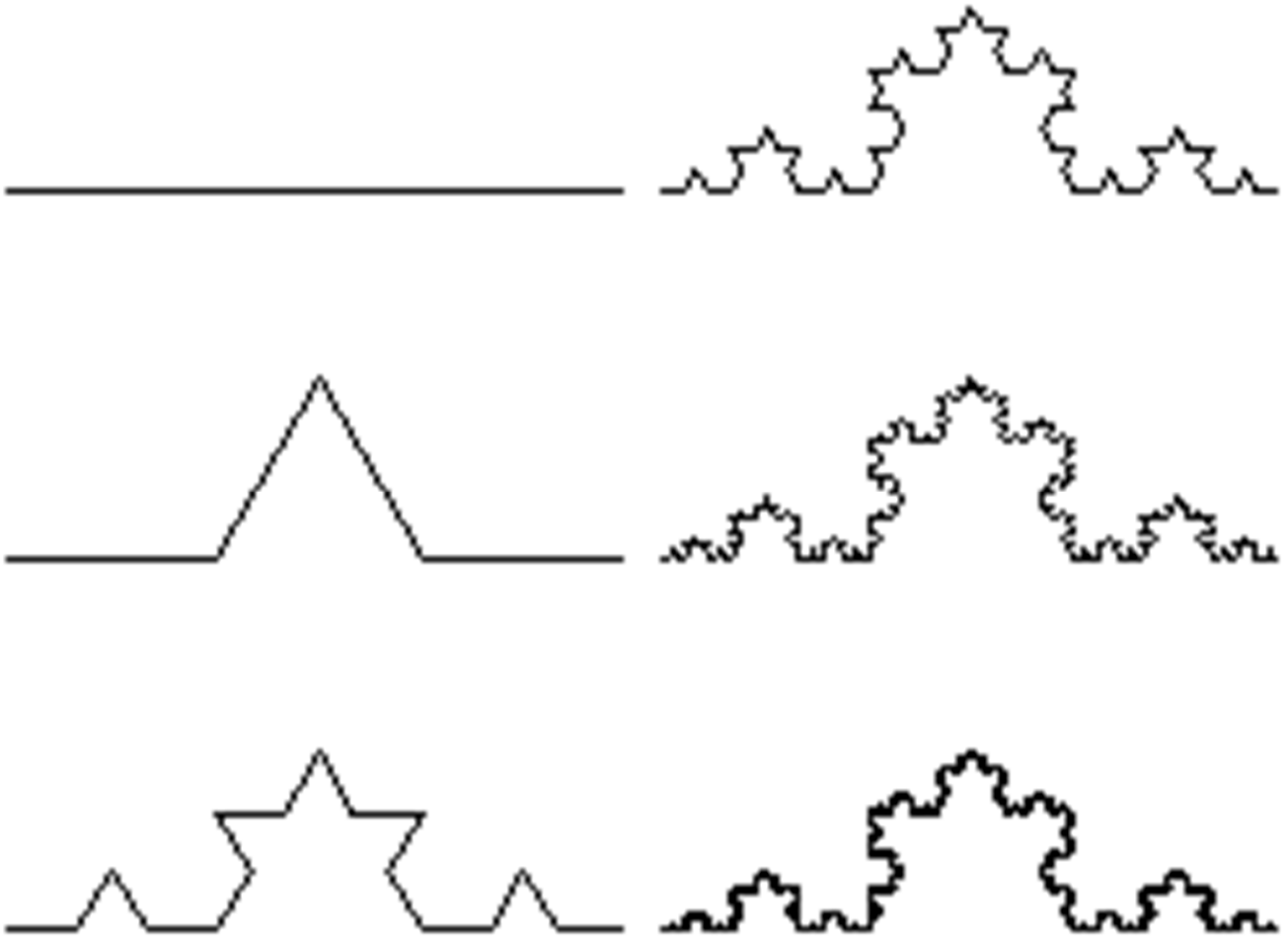
Fractal dimension



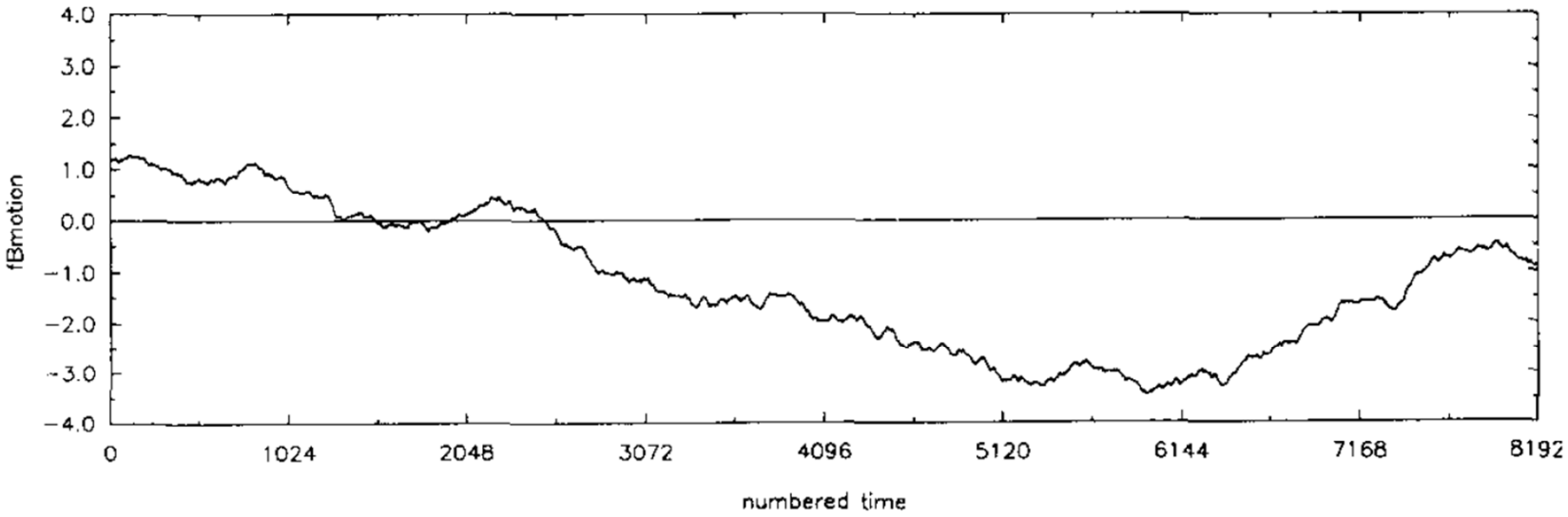
Fractal dimension

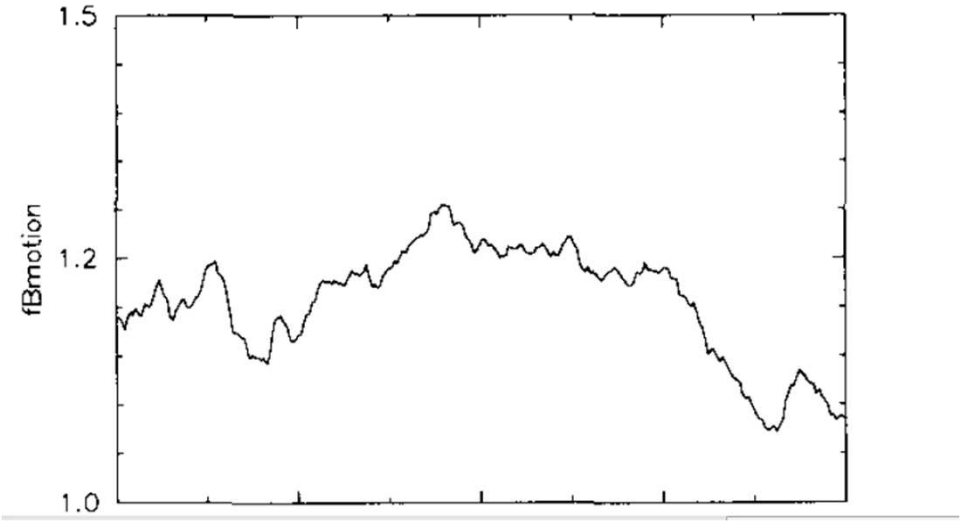


Fractal dimension



Fractal analysis

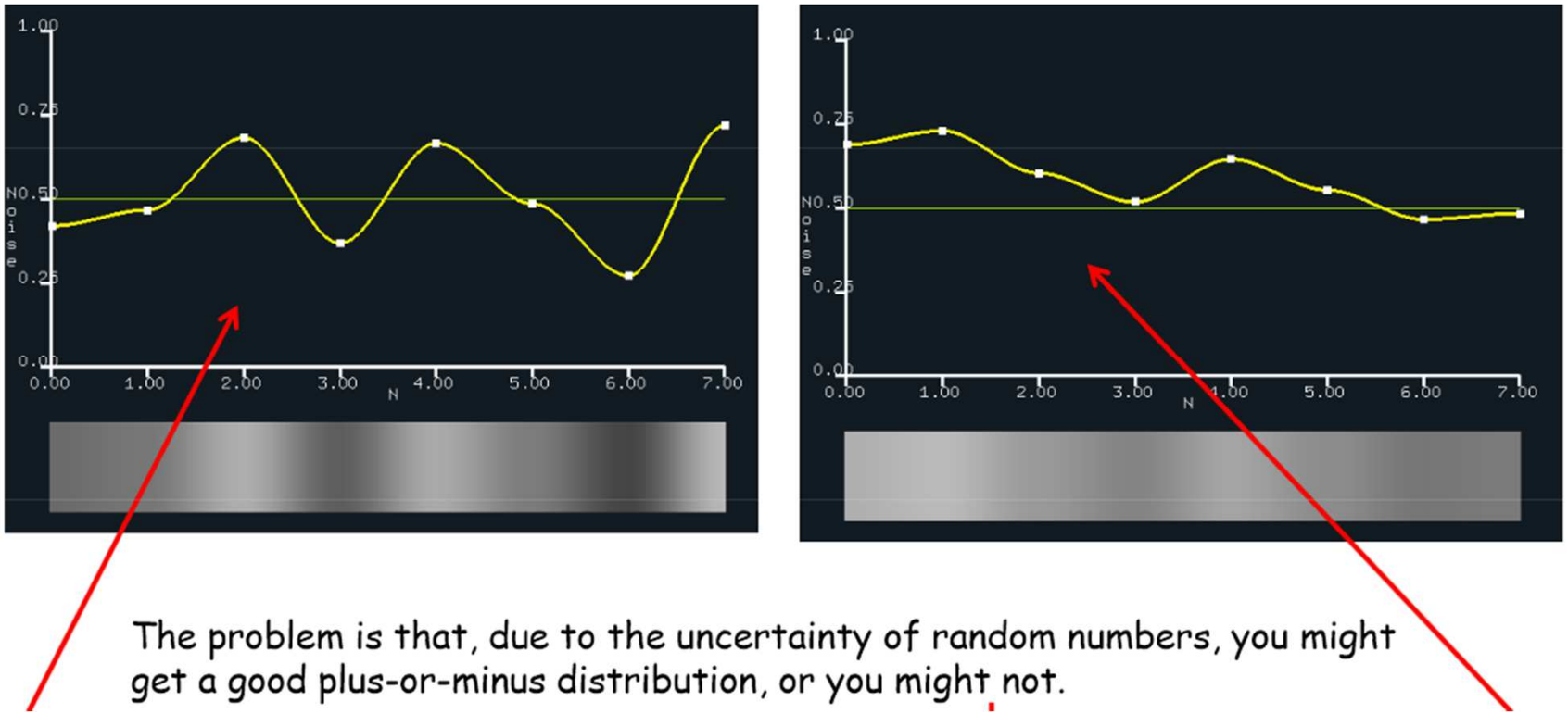




Fractal synthesis

Positional Noise

Idea: Pick a random number at the whole-number input values and then fit a piecewise smooth curve through those points.

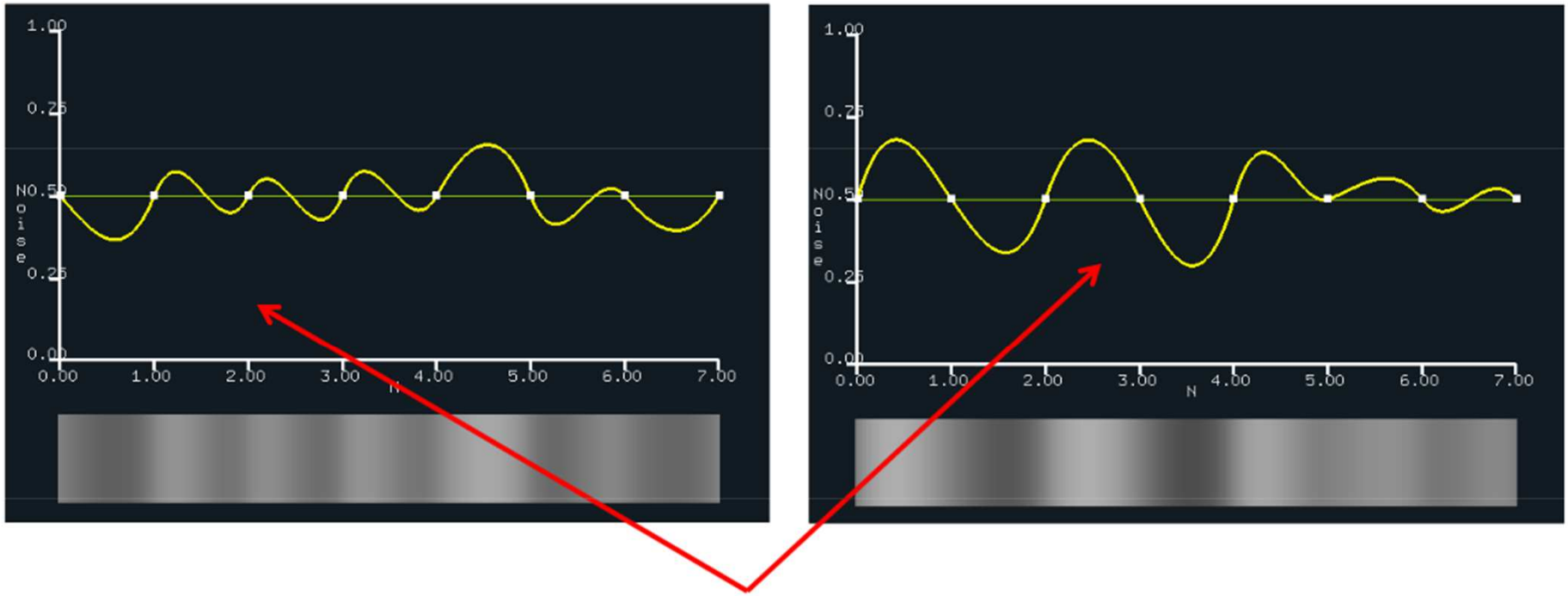


The problem is that, due to the uncertainty of random numbers, you might get a good plus-or-minus distribution, or you might not.

Fractal synthesis

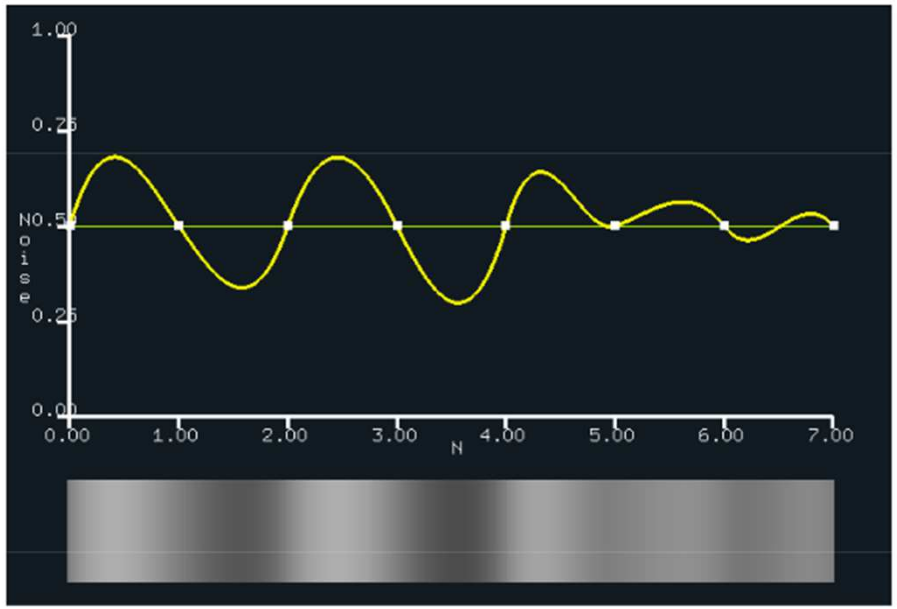
Gradient Noise

Idea: Place points at the mid-line at the whole-number input values use random numbers to pick gradients (slopes) there, and then fit a piecewise smooth curve through those points with those slopes.

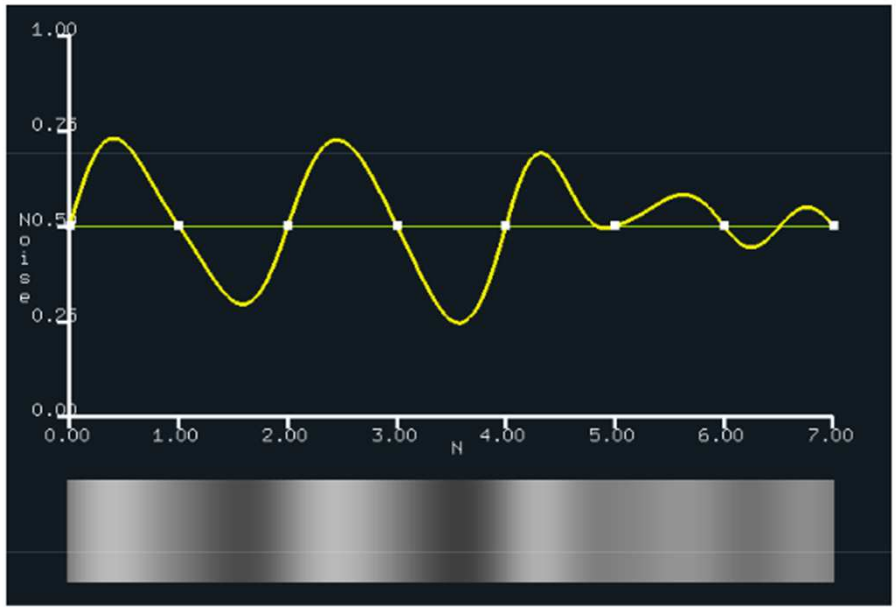


No matter what, you will get a good plus-or-minus distribution.

Fractal synthesis

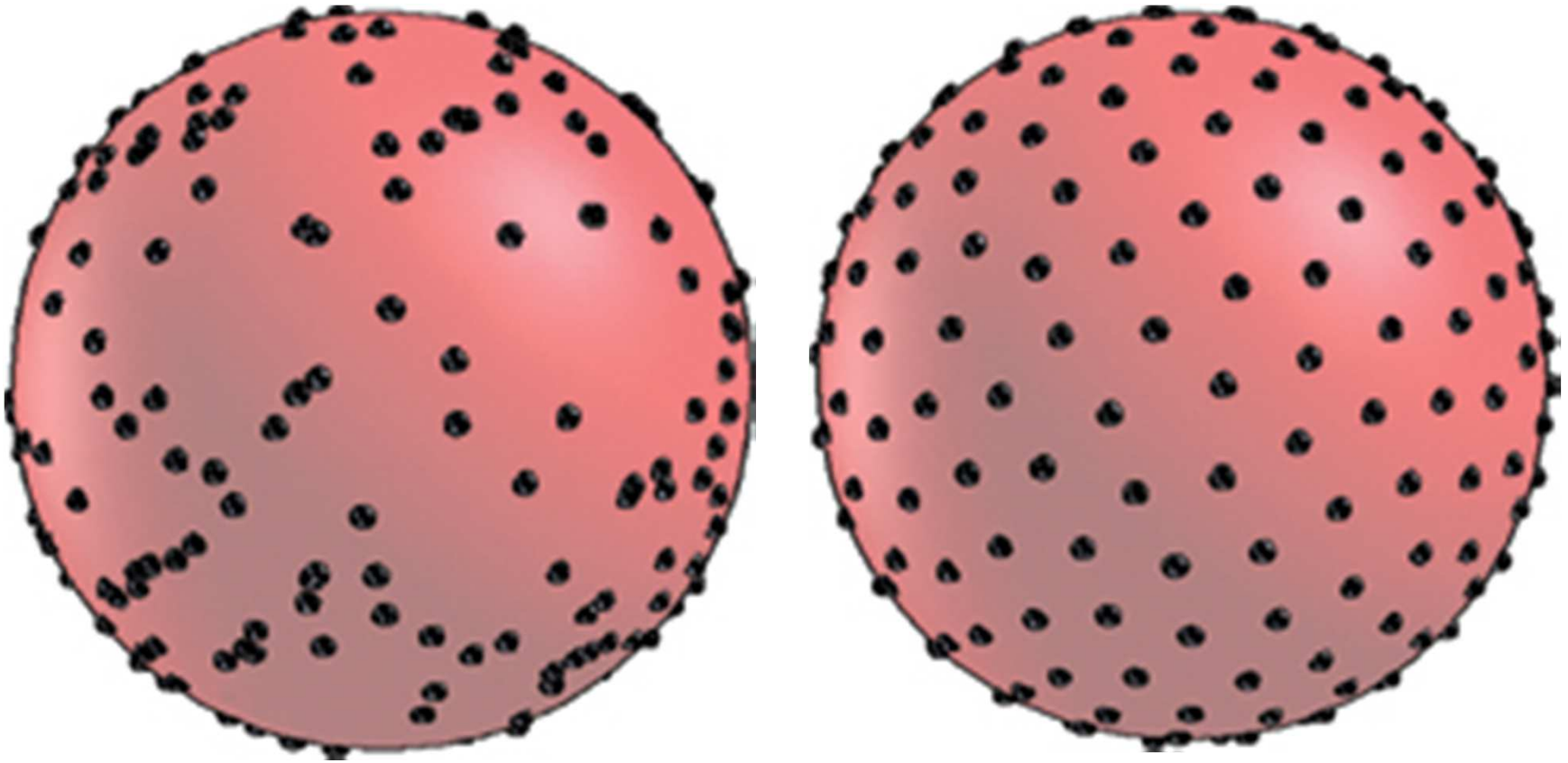


Cubic: C^1 continuity at the whole-number values



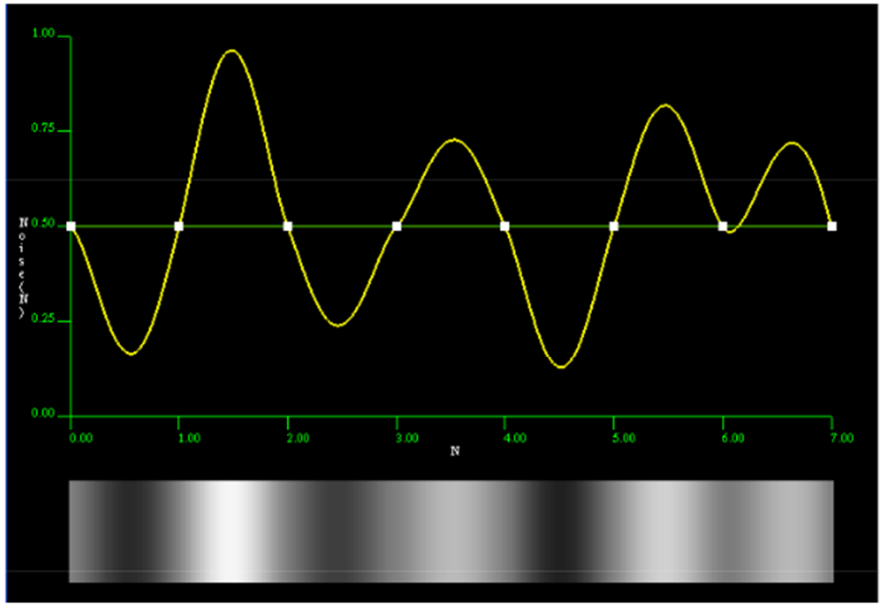
Quintic: C^2 continuity at the whole-number values

Fractal synthesis

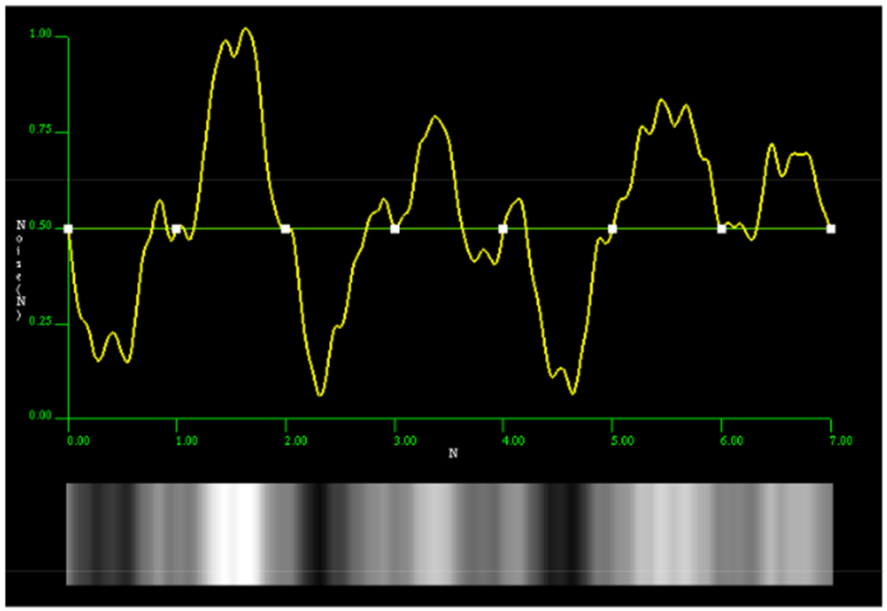


Noise Octaves

Idea: Add multiple noise waves, each one twice the frequency and half the amplitude of the previous one



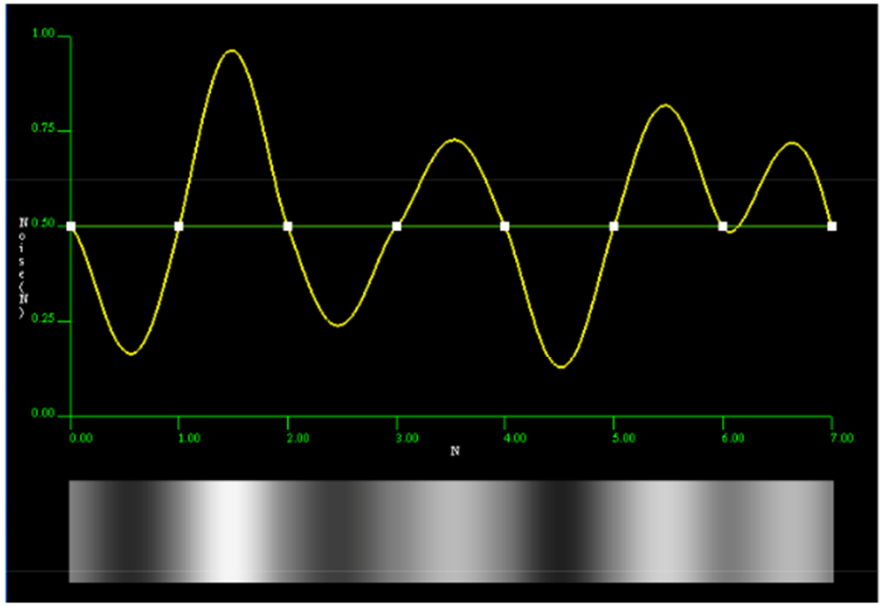
1 Octave



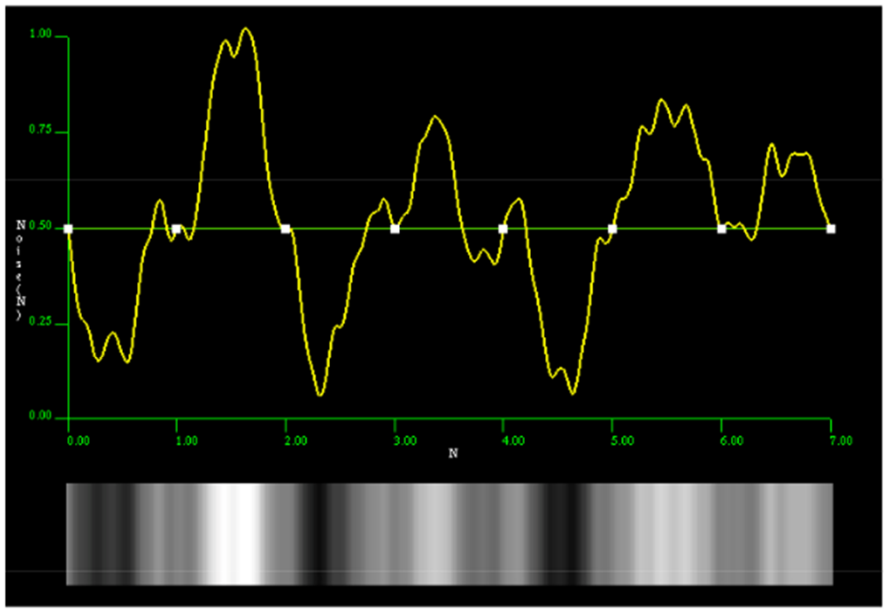
4 Octaves

Noise Octaves

Idea: Add multiple noise waves, each one twice the frequency and half the amplitude of the previous one

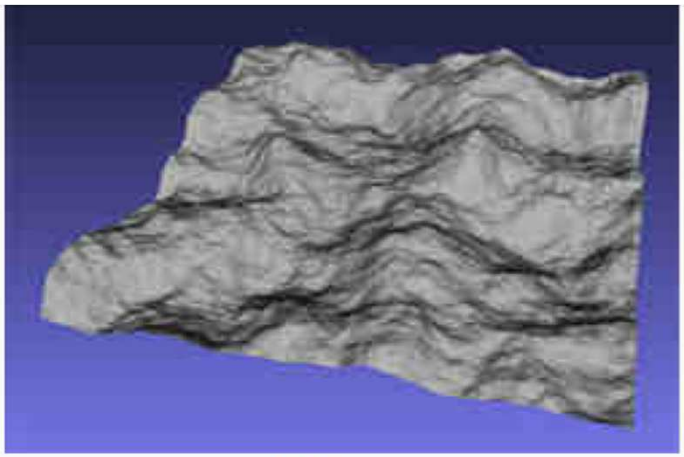


1 Octave

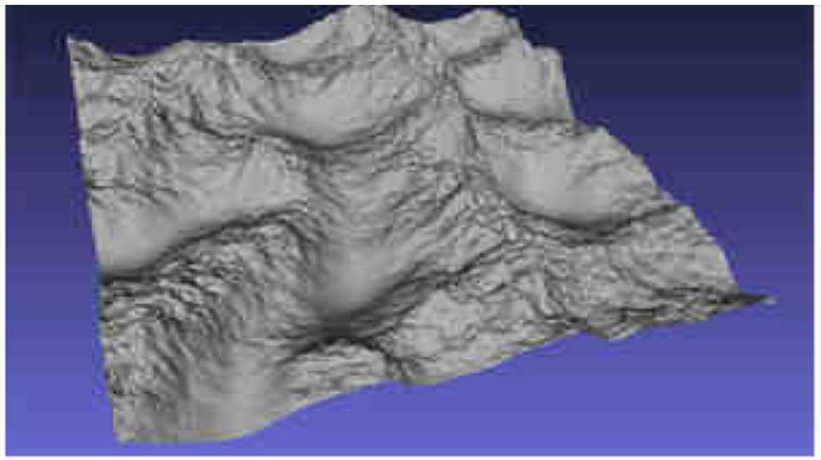


4 Octaves

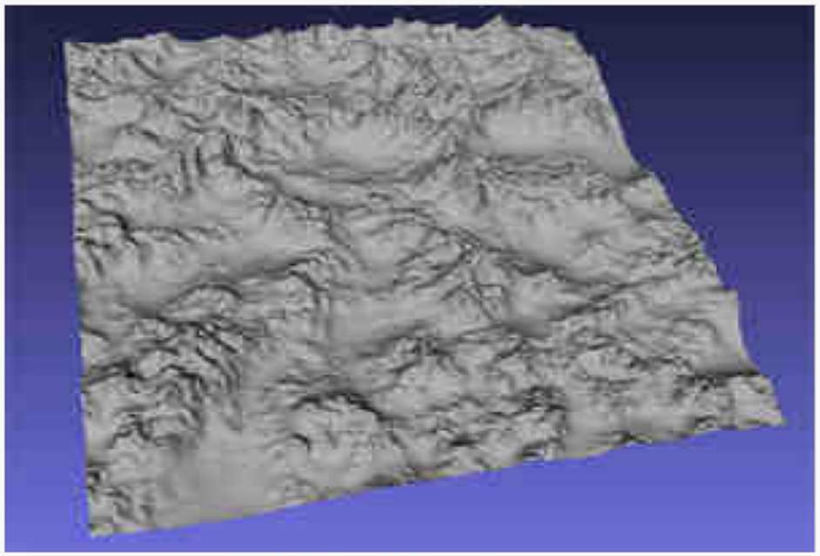
More fractal functions



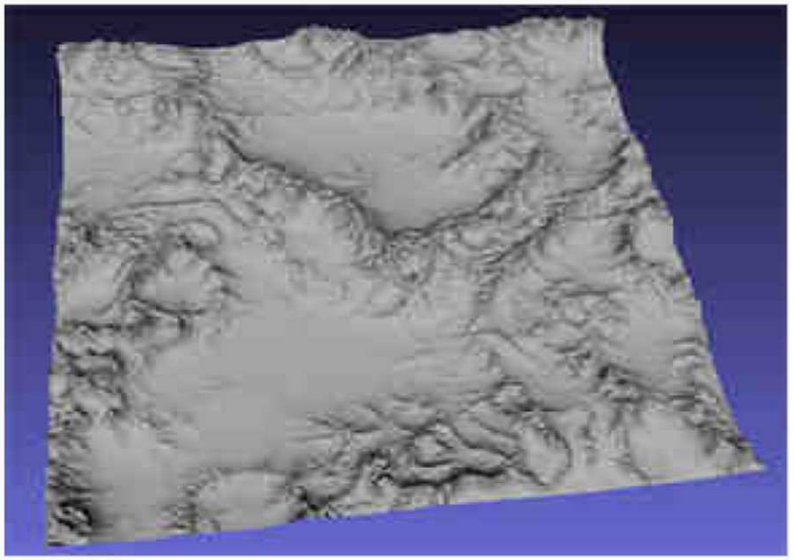
FBM terrain



Heterogeneous multifractal terrain



Hybrid multifractal terrain



Ridged multifractal terrain