

Fractals

13.1 Later Developments



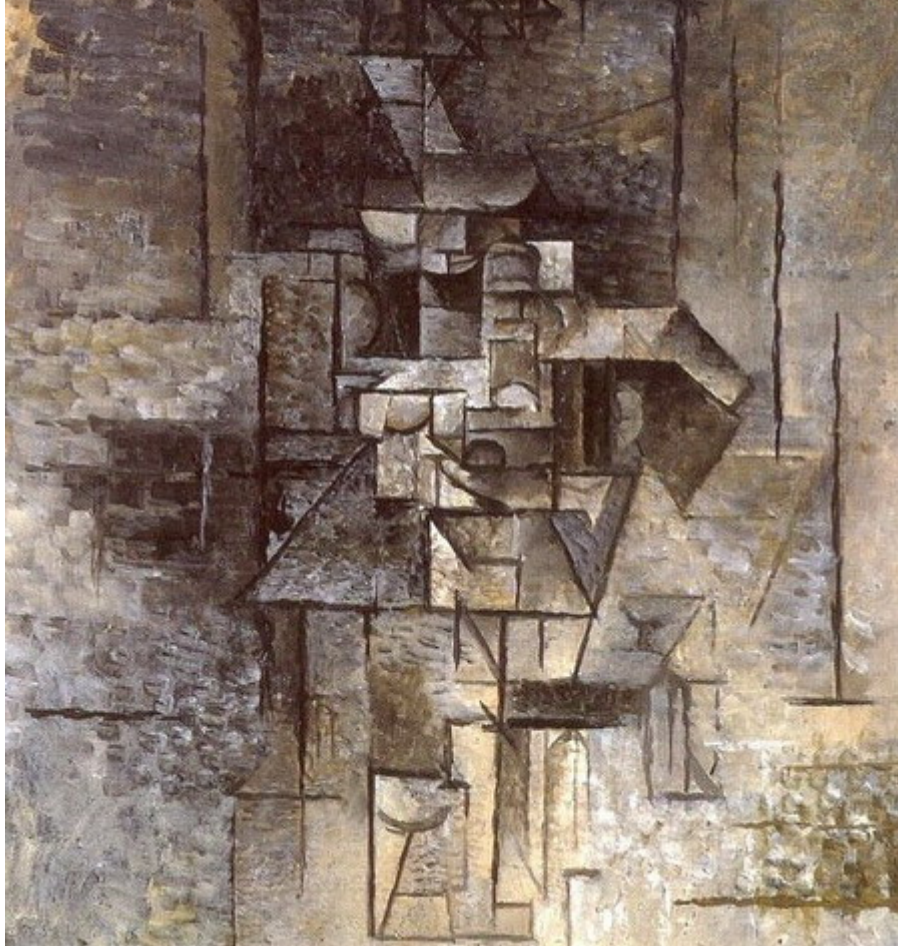
Paul Cézanne (French, 1839 - 1906)



[PD-US](#), [Link](#)

Henri Matisse (French, 1869 - 1954)

Pablo Picasso (Spanish, 1881 - 1973)



By [Pablo Picasso](http://www.pablo-ruiz-picasso.net/work-3193.php) - <http://www.pablo-ruiz-picasso.net/work-3193.php>, PD-US, [Link](#)



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13.2 Abstract Expressionism



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Robert Motherwell (American 1915 - 1991)



Mark Rothko (Russian-American, 1903 - 1970)

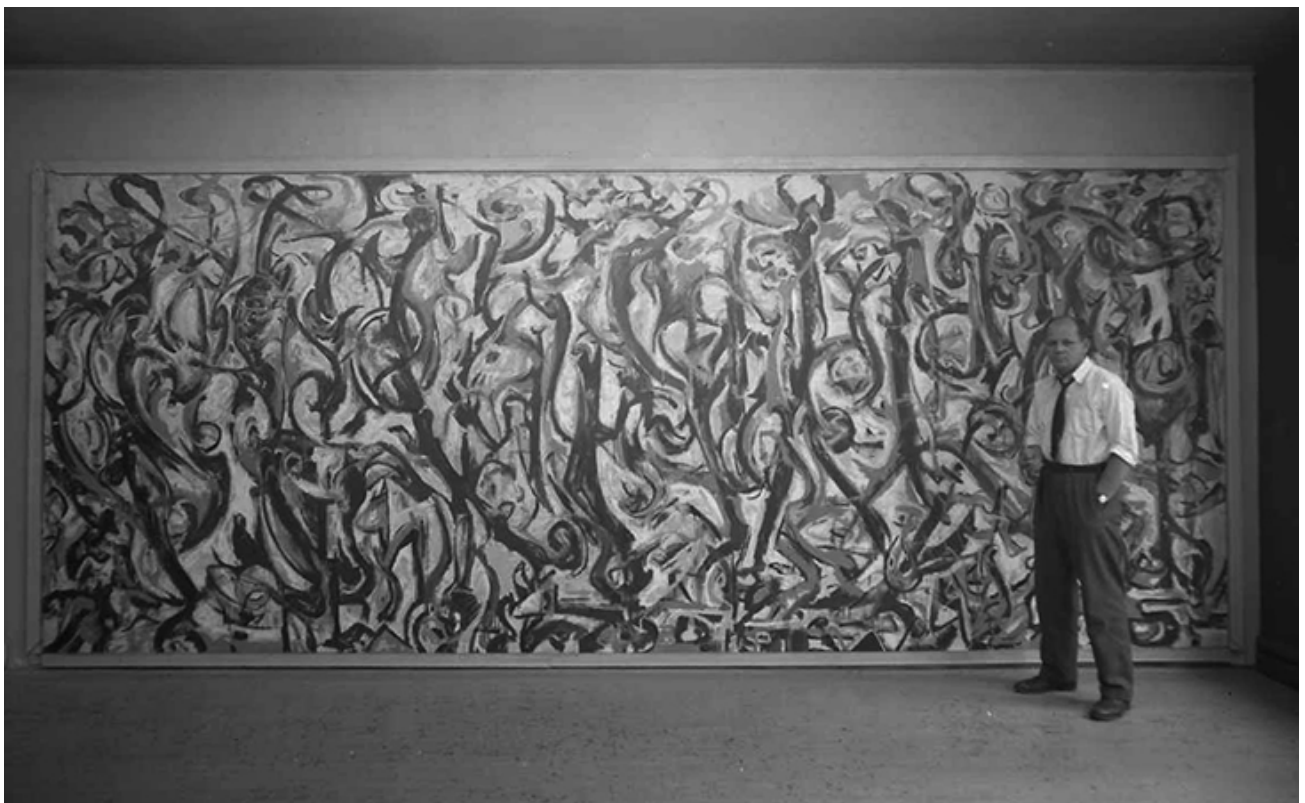




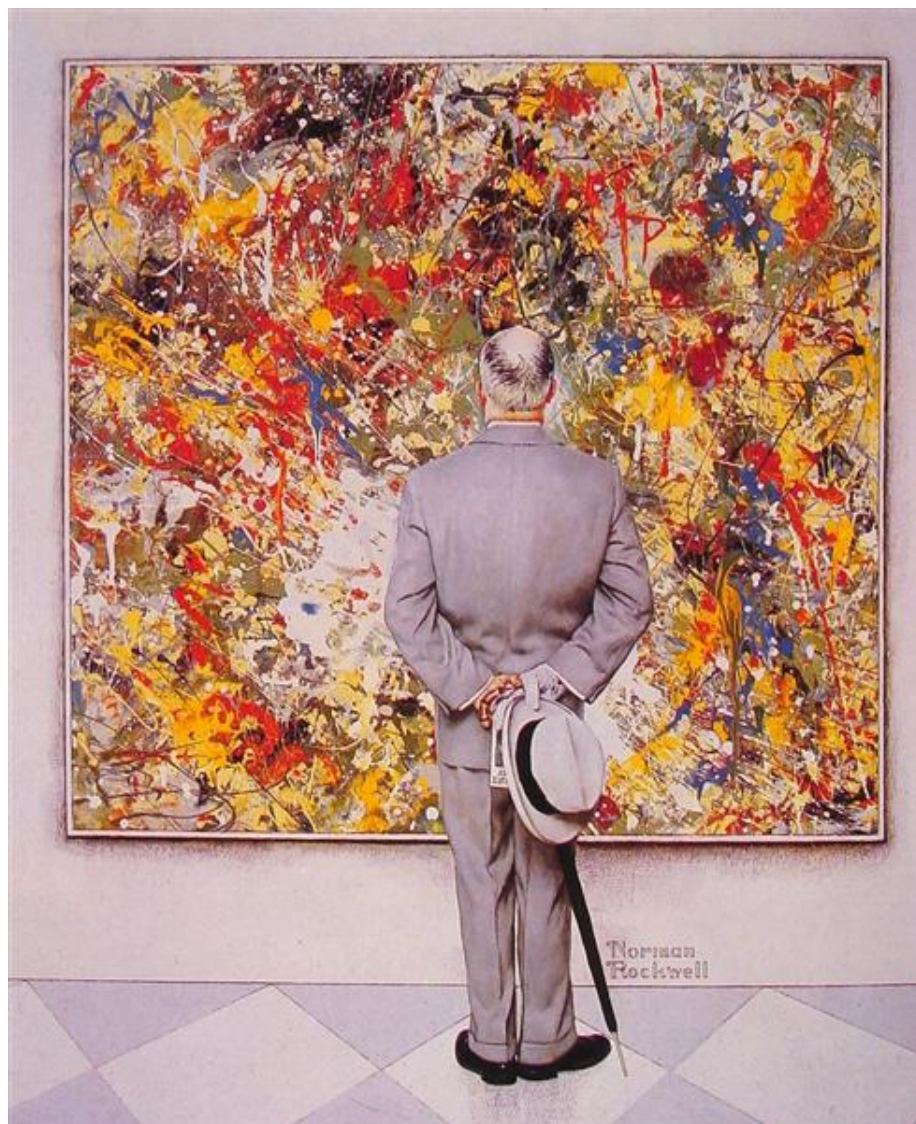
Willem de Kooning (Dutch-American, 1904 - 1997)



Jackson Pollock (America, 1912 - 1956)







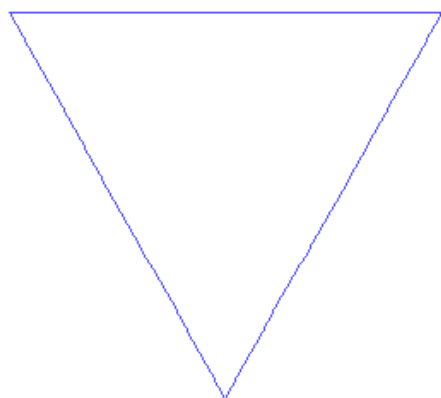
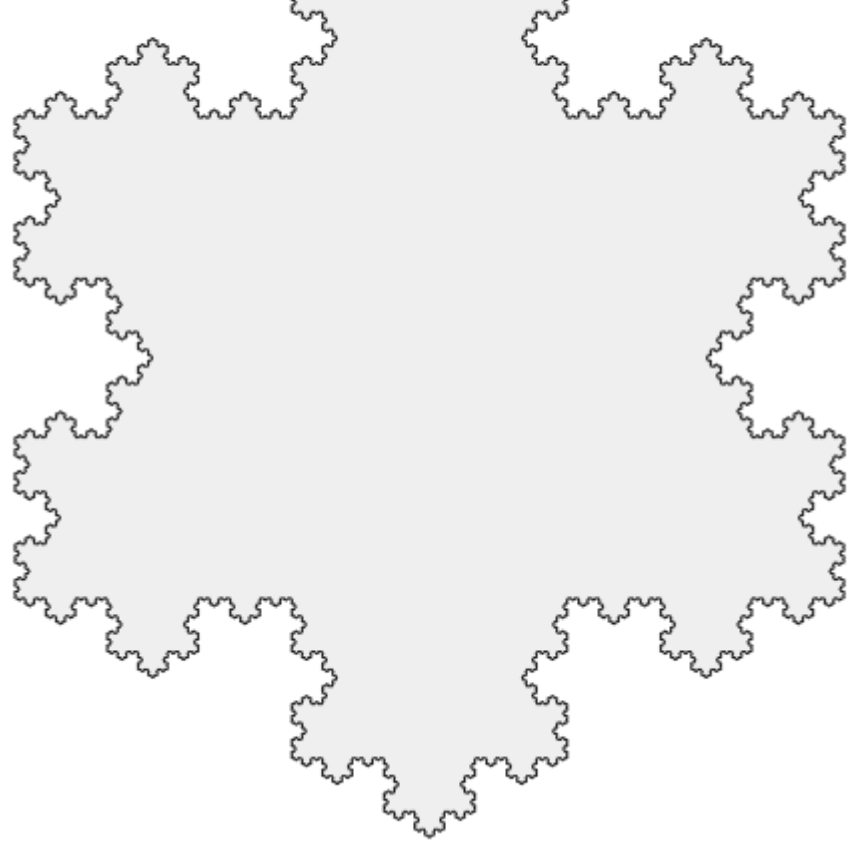
The Connoisseur, Norman Rockwell (American, 1894 - 1978)

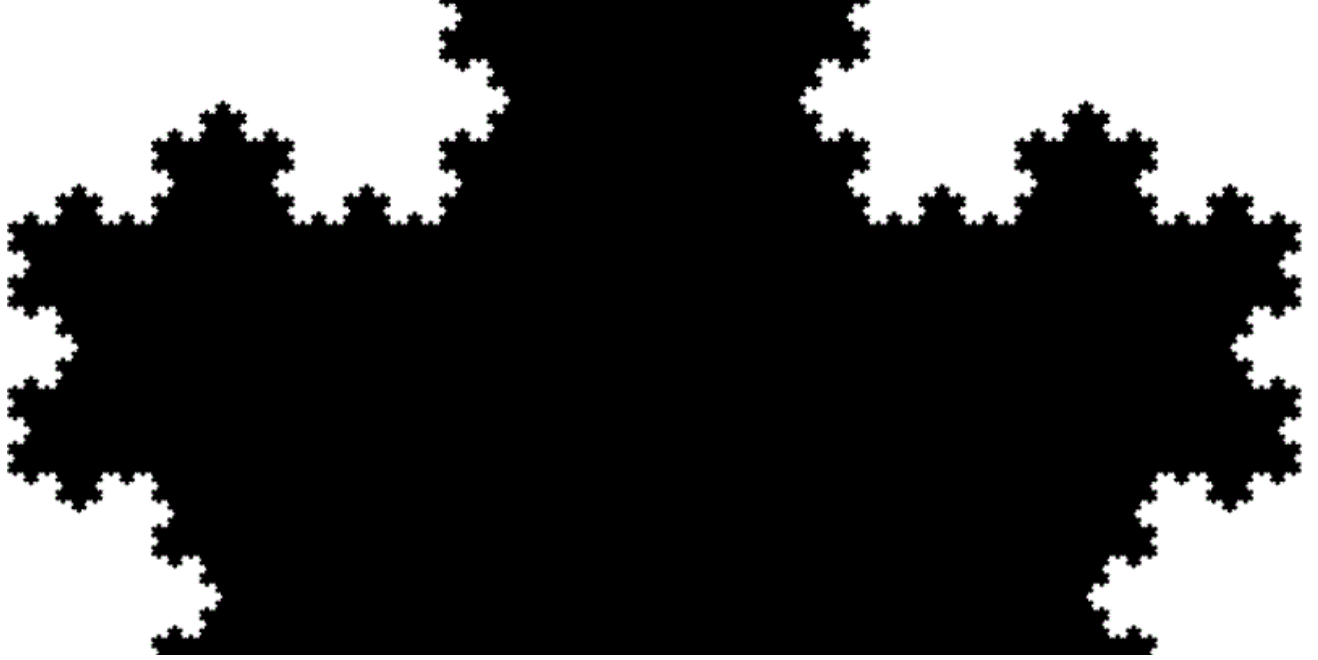




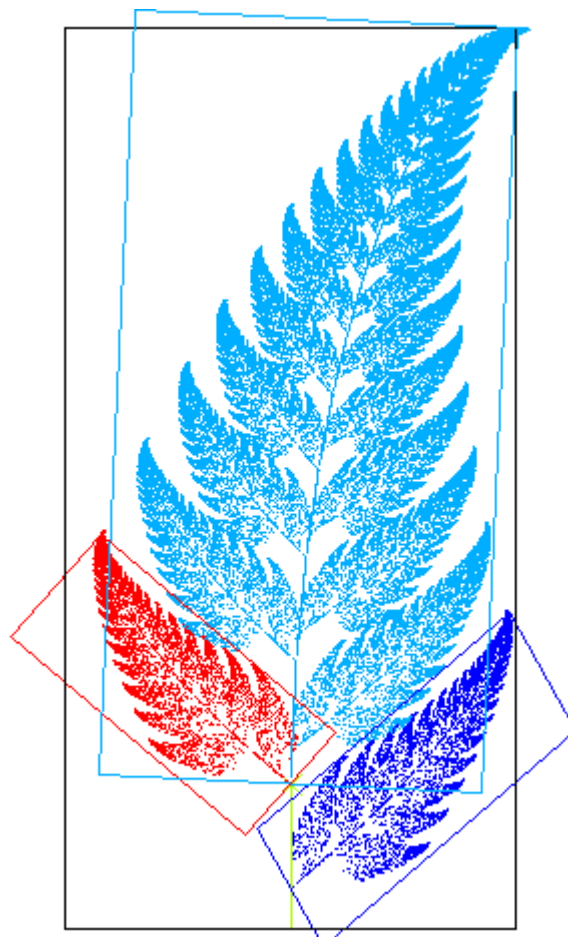
13.3 Fractals

Koch Snowflake

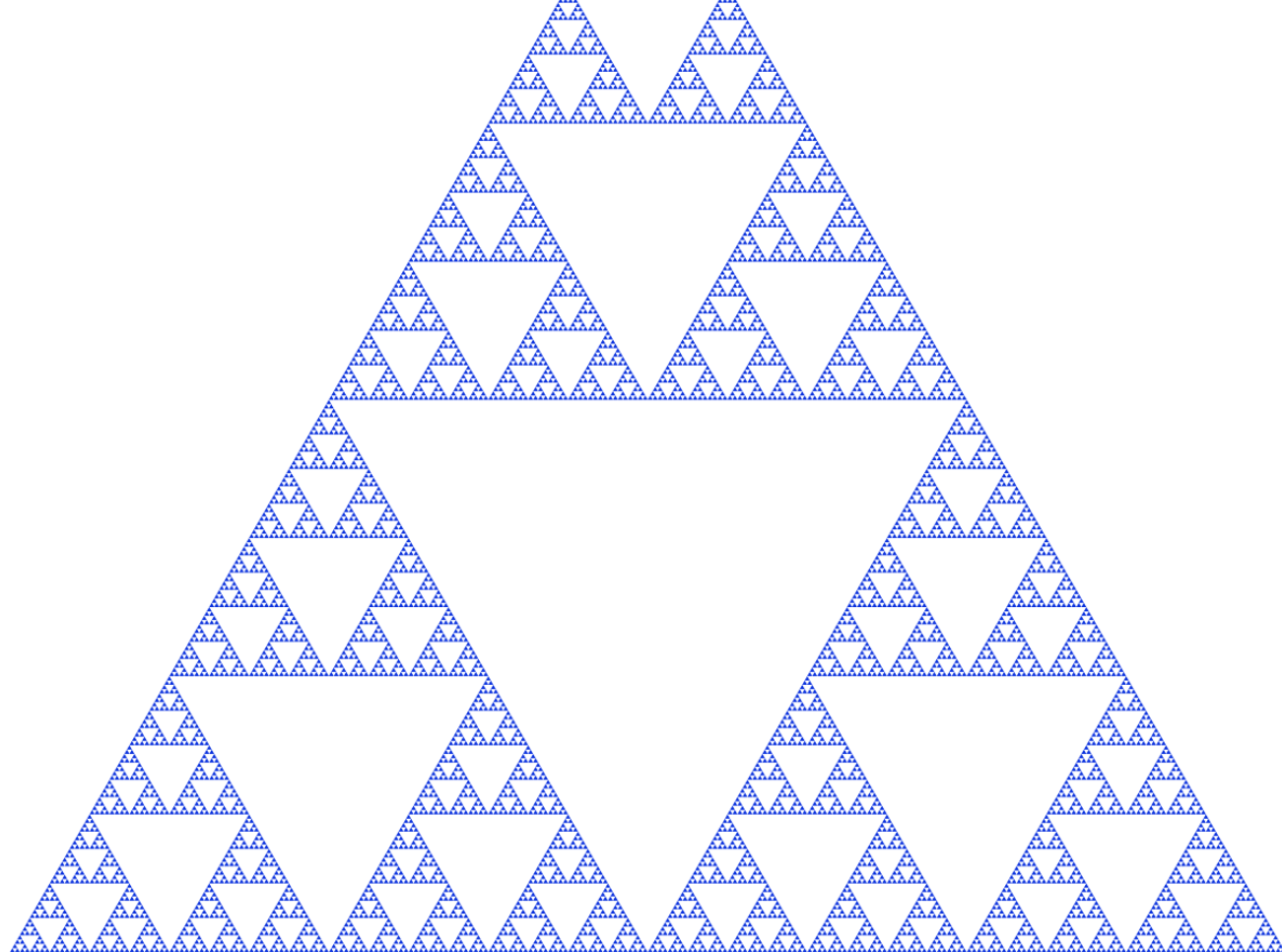




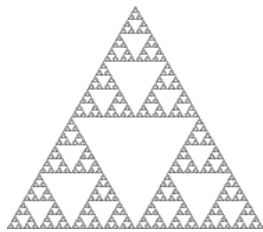
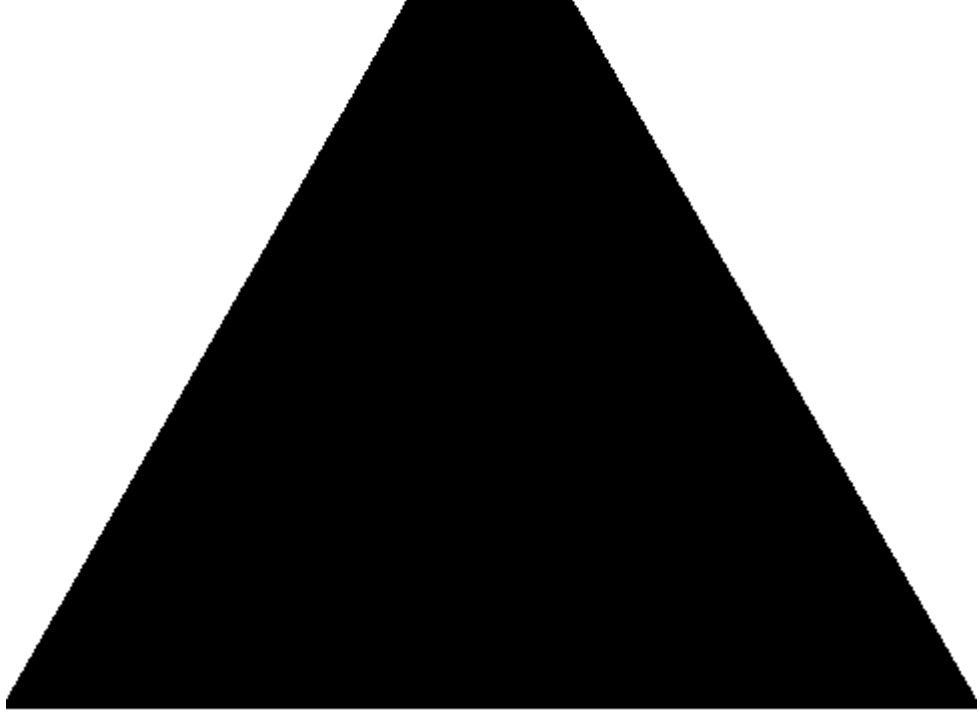
Fractal Fern



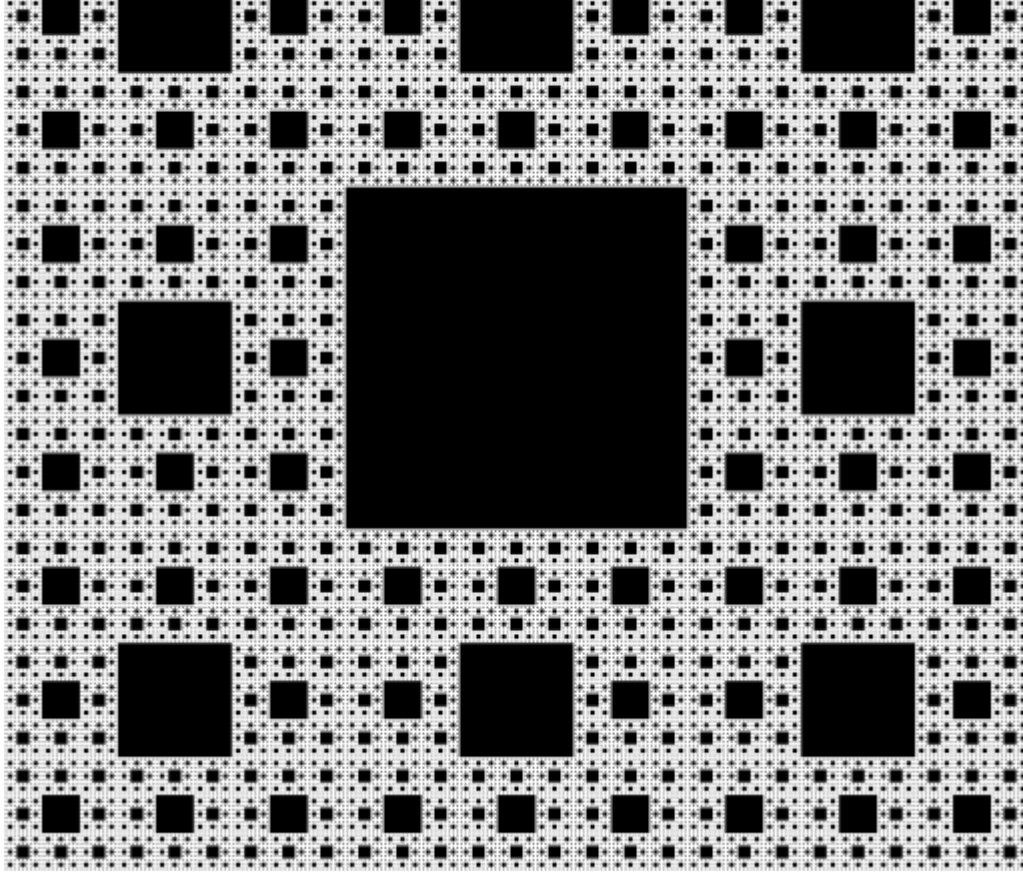
Sierpinski Triangle



By Beojan Stanislaus, [CC BY-SA 3.0](#), [Link](#)



Sierpinski Carpet



Katsushika Hokusai
葛飾 北斎 (Japanese, 1760 - 1849)

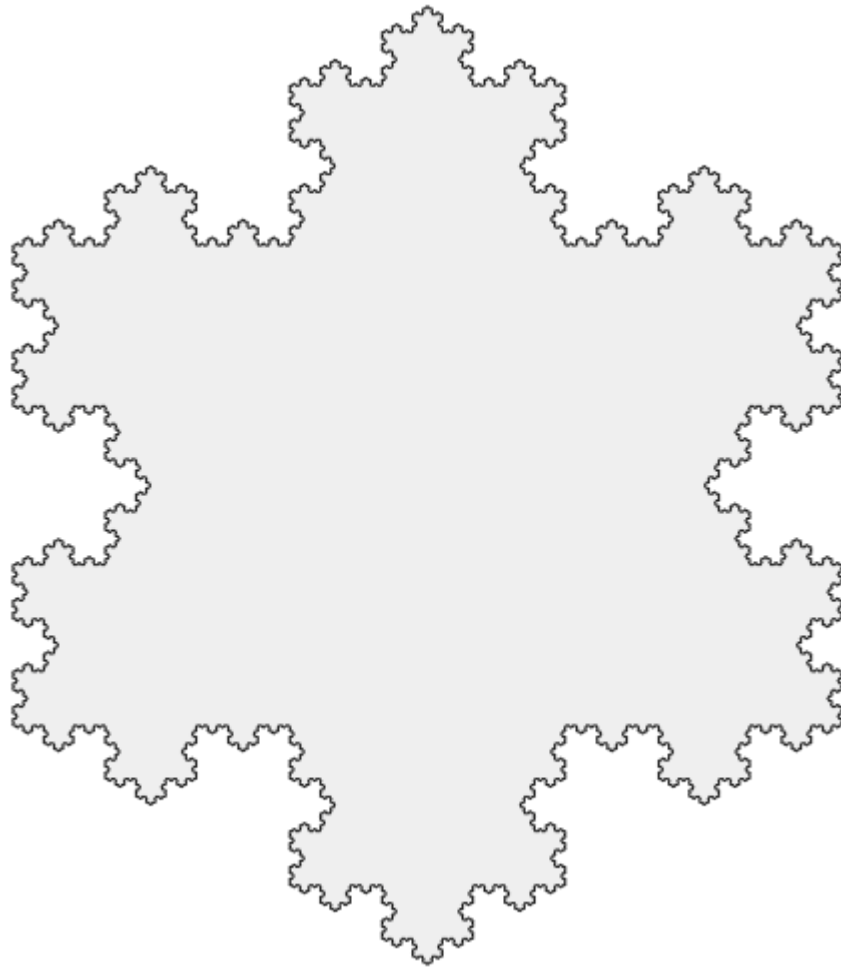
The Great Wave off Kanagawa



As we see in the Koch snowflake example, curves which exhibits "self-similarity" seem to have different lengths at different scales of magnification.

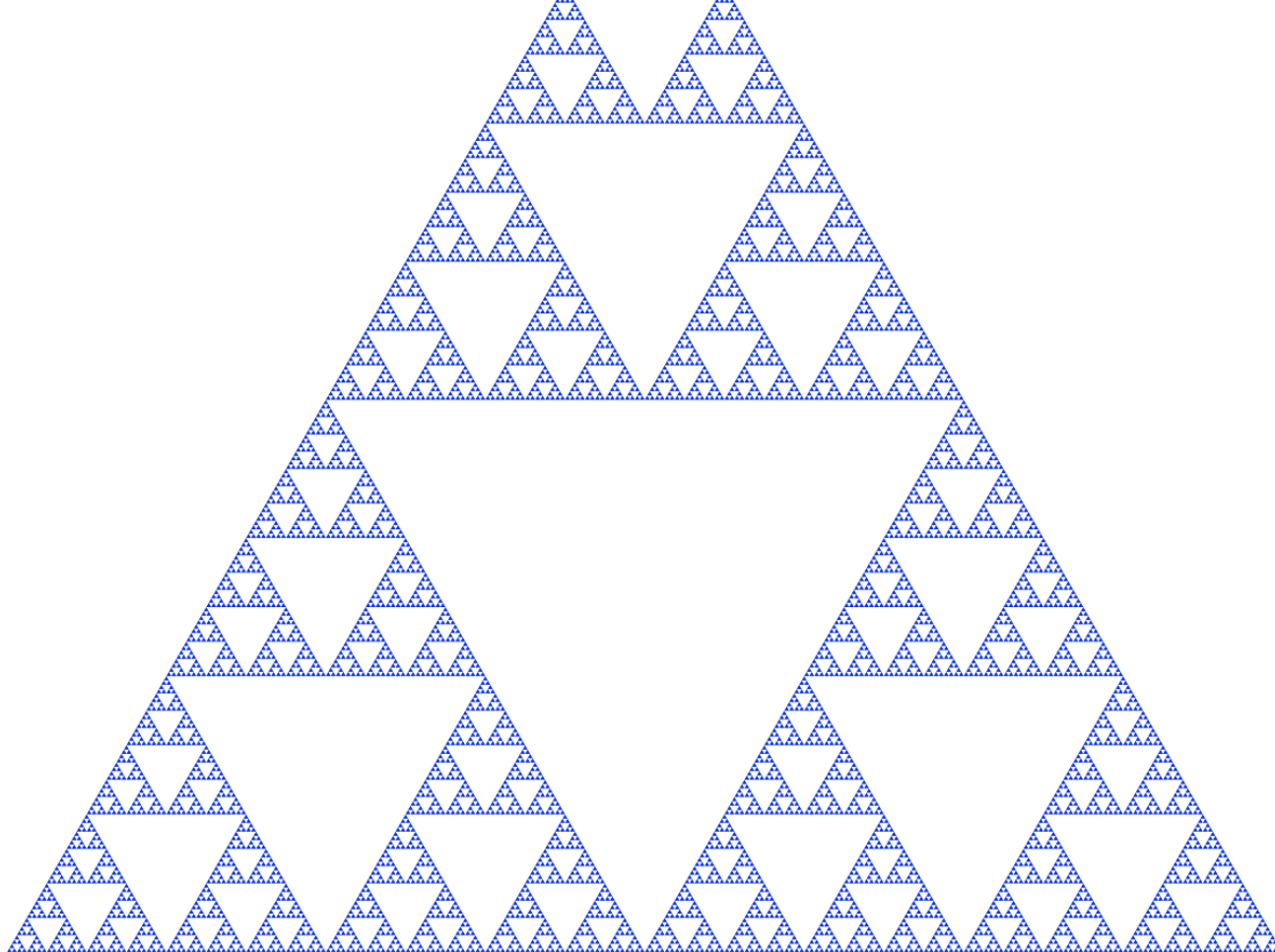
The Koch snowflake has dimension:

$$\log_3 4 \approx 1.2619.$$



The Sierpinski triangle, which may be constructed by "hollowing out" a filled-in triangle (which has dimension 2), has dimension:

$$\log_2 3 \approx 1.5850.$$

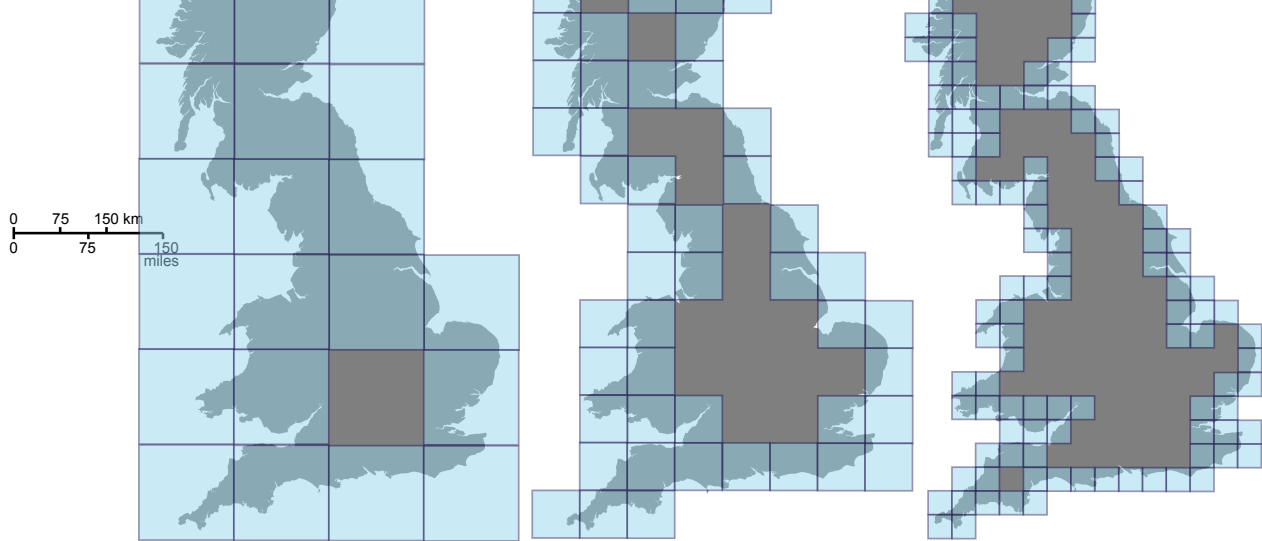


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13.4 Fractal Dimension

One way to compute the dimension of a set S is the so-called "Box Counting" method:

1. Position the set S in question in a rectangular box.
 2. Subdivide the rectangular box into squares of the same width s .
 3. Count the number N of boxes which has non-empty intersection with S under examination.
 4. Compute $\log_{\frac{1}{s}} N$.
 5. Repeat the procedure with smaller and smaller boxes. In many cases, as the size of the boxes tend to zero, the quantity computed in Step 4 approaches a fixed number. This number is the (fractal) dimension of the set S .
-



Computing the dimension of the coastline of Great Britain via the box-counting method. In 1999, Richard P. Taylor, Adam P. Micolich, and David Jonas announced in the science journal *Nature* that they had applied fractal analysis onto the drip paintings of Jackson Pollock, and claimed to discover that as "Pollock refined his dripping technique, the fractal dimensions increased steadily through the years, from close to 1 in 1943 to 1.72 in 1952."

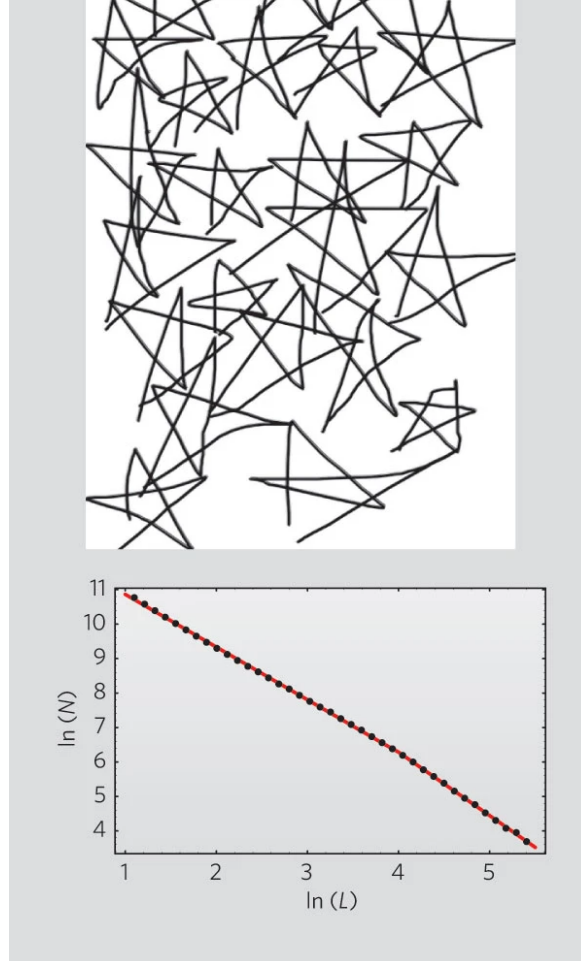
In another article (Physics World, Volume 12, Issue 10, October 1999), the authors stated that "because [the fractal dimension] follows such a distinct evolution with time, the fractal analysis could be employed as a quantitative, objective technique to both validate and date Pollock's drip paintings. In conclusion, Pollock's contribution to the evolution of art is secure. He described Nature directly. Rather than mimicking Nature, he adopted its language - fractals - to build his own patterns."

Articles

- [*Fractal analysis of Pollock's drip paintings*, Richard P. Taylor, Adam P. Micolich, David Jonas. *Nature* 399, 422 \(3 June 1999\).](#)
- [*Fractal expressionism*, Richard P. Taylor, Adam Micolich and David Jonas. *Physics World*, Volume 12, Issue 10, October 1999.](#)
- <http://authenticationinart.org/pdf/literature/Richard-P.-TaylorOrder-in-Pollocks-Chaos.pdf>

HOWEVER...

In a 2006 article published in *Nature*, Katherine Jones-Smith and Harsh Mathur claimed to have debunked the thesis of Taylor *et al.* by presenting a freehand drawing which, by the criteria set by the latter authors, would qualify as a "high-quality" fractal:



Moreover, according to Jones-Smith: "Known Pollock paintings, hanging in museums and worth millions of dollars, don't pass Taylor's criteria, and then there are the paintings by [other painters] that do pass, even though they are definitely not by Pollock."

I think it is more appealing that Pollock's work cannot be reduced to a set of numbers with a certain mean and certain standard deviation

--Katherine Jones-Smith

Articles

- Jones-Smith, K., Mathur, H. Revisiting Pollock's drip paintings. Nature 444, E9–E10 (2006). <https://doi.org/10.1038/nature05398>
- <https://www.sciencedaily.com/releases/2007/11/071125114847.htm>

