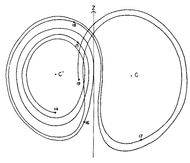
Early visualizations of chaos and wild dynamics

During the 1960s and 1970s, mathematicians crafted images to explore invisible dynamical worlds. Whether drawn by hand or generated through carefully designed algorithms, these visualizations stand at the crossroads of mathematics, craft, technology, and art. They are not merely records of discovery—they have often been the very means by which new mathematical worlds were revealed.

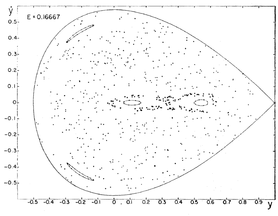
While studying a simplified model of atmospheric circulation, Lorenz discovered sensitive dependence on initial conditions and plotted the now-famous Lorenz attractor.



1963

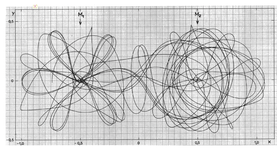
Arnold sketches his understanding of the dynamics near an elliptic fixed point.

Hénon and Heiles' numerical experiments on galactic motion reveal the coexistence of elliptic islands and a chaotic sea.



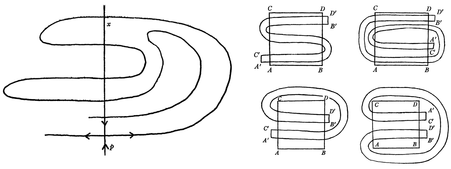
1964

1966



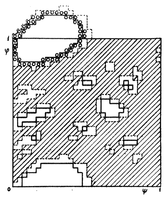
Hénon's numerical experiment shows chaotic behavior in the three-body problem of celestial mechanics.

1967



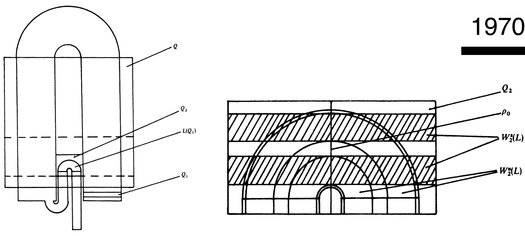
Smale introduces the horseshoe as a topological model for homoclinic intersections.

1969



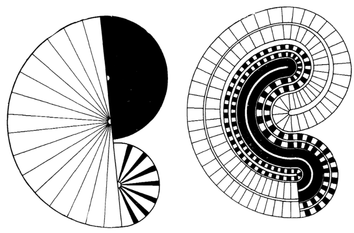
Chirikov's standard map models problems in nuclear physics through a surface dynamical system. His numerical experiments display elliptic islands surrounded by a chaotic sea.

1970



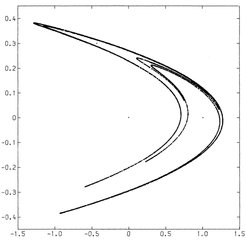
Newhouse discovers wild horseshoes leading to robust homoclinic tangencies.

1974



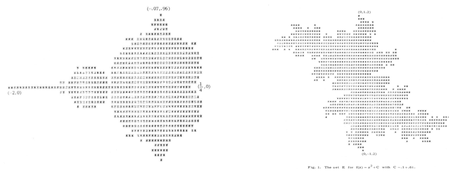
Plykin constructs the first planar hyperbolic attractor.

The Hénon attractor for the map $(x, y) \mapsto (y + 1 - a \cdot x^2, b \cdot x)$ with $a = 1.4$ and $b = 0.3$.



1976

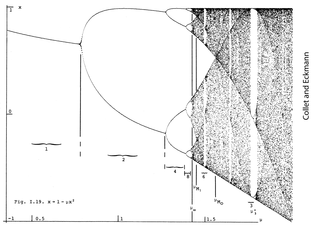
1978



First computer images of the Mandelbrot and Julia sets by Brooks and Matelski.

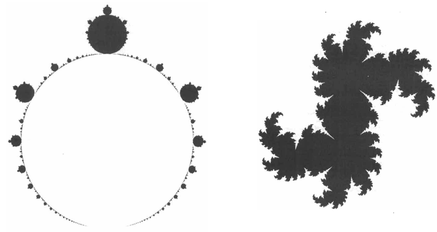
Evidence of abundance of chaos in the family of maps:

$$x \mapsto 1 - a \cdot x^2$$

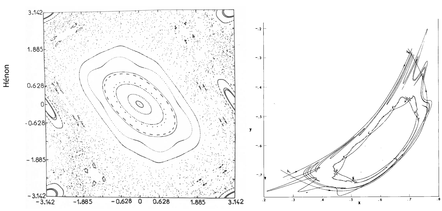


Collet and Eckmann

1980



High-definition images of the Mandelbrot and Julia sets by Mandelbrot.



Hénon

High-definition images of elliptic islands and homoclinic intersections.