

Chaos – The Movie

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It is my personal mission as an artist to illuminate the intrinsic beauty of mathematics in a purely aesthetic realm. Translating mathematical subject matter to the picture plane of my drawings, I strive to enable viewers to appreciate this aesthetic, regardless of their mathematical background. I express the grace and beauty I find in mathematics through symmetries, patterns and proportions in my art. Many of my drawings are related to growth patterns such as the Fibonacci sequence and binary growth. I begin my work process by creating a plan or an algorithm. I make all of the decisions for the work beforehand and make a detailed plan in a large spiral drawing tablet that I refer to as my plan book. After I write out all of the specifications, I generate the actual drawing by hand using the rules from the plan. Through my drawings I hope to express both the aesthetics of my mathematical subject matter, as well as the aesthetics of the process of algorithmic generation.

In the past few years I have become interested in generating drawings using fractal forms based on the repetition of similar shapes. I begin with a largest instance of a shape and incorporate copies scaled by powers of $\frac{1}{2}$. I developed a drawing based on the four quadrants of the Cartesian coordinate system. Each drawing begins with 8 spokes. The line segments fall on the coordinate axes and the lines $y=x$ and $y=-x$. Once I have drawn the initial shape, each spoke becomes the starting point for a new 8-spoke shape in which the line segments are $\frac{1}{2}$ as long as the original spokes. Then those 64 spokes become the starting point for 8-spoke figures with line segments $\frac{1}{4}$ the length of the first line segments. Next, the 512 spokes each become the bases for an 8-spoke shape with line segments $\frac{1}{8}$ the length of the original spokes. This process creates a circular fractal network of lines. While producing these drawings, I have developed a type of mantra to remember where I am in the drawing. I need to keep count and this becomes quite complicated and rhythmic especially when I reach the third iteration.

Mathematics and art both enable humans to better understand the world around them by uncovering patterns and structures. Chaos Theory is one of the topics in mathematics that, I feel, particularly throws light on the intricacies of the human condition. Chaos Theory shows that even within apparent disorder there can often be found both order and structure. My investigation took me to the earliest ideas on Chaos Theory. In 1961 Edward Lorenz inadvertently discovered the phenomenon of sensitive dependence on initial conditions by noticing the effect of rounding off decimals had in a computer-generated sequence of calculations for weather prediction. This event marked the (re-) discovery of what is now commonly known as Chaos Theory. I decided to visually interpret this phenomenon in my drawings, by using my basic 8-spoke pattern and continuing with multiple iterations using stencils with a small margin of error. The errors accumulate to create these cloud-like, chaos-derived drawings. If the viewer spends a few moments gazing into what at first appears to be a chaotic cloud they will begin to see the pattern of the fractals develop. There is a hidden structure to these drawings, as well as a sense of growth through time. This process of layering iteration

on top of iteration takes weeks of work and through the process the drawings go through interesting changes and developments. I wanted a way to incorporate this sense of time and change into my art. It was time to make a movie.

I started with a fresh large black sheet of paper. Then I installed a digital camera over my drawing table. I began my drawing process, but after each line I took a still shot of the drawing. I continued this process over months. I wanted the movie to have an organic handmade feeling to it so I made a number of changes throughout the process. The frequency with which I photographed the drawing fluctuated. Sometimes I would take a picture after each line, sometimes I would complete a small cycle of lines before taking a picture. This change produced skips and jumps in the rhythm. Occasionally, I moved the camera closer to or farther away from the drawing. I also included myself in the photos as the generating mechanism: there are a few shots where you can see my hands. At a point where the drawing was getting quite complicated, I adjusted the camera so you could see my feet coming and going from view: the drawing was becoming a dance. Leaning over to draw and then pulling away to take a picture created a very physical element to this work and I wanted to express that physicality. Thousands of still digital photographs were taken during the drawing process. These photographs were put into consecutive order and then repeated in reverse to create the sense of both growth and decay. The edited product is a 6 minute video titled “Chaos Night”.

I knew from the beginning of the process that I would add music into the final production. I contacted composer Max Schreier, and discussed the structure and mathematics I wanted incorporated into the music. I wanted to make sure the number 8 played a major role in the structure of the music to mirror the 8 spokes of the drawing. Max agreed to write and perform a 6 minute composition based on these specifications. Influenced by Arnold Schoenberg, he based the music on a series of 8 sequential notes. While the bottom voice of the organ plays a drawn out rhythm associated with the first iteration of the drawing, the violin accelerates with the increased speed of the smaller iterations. The right hand of the organ creates small disturbances, each catalyzed by the random insertions of hands, feet and rulers in the video.

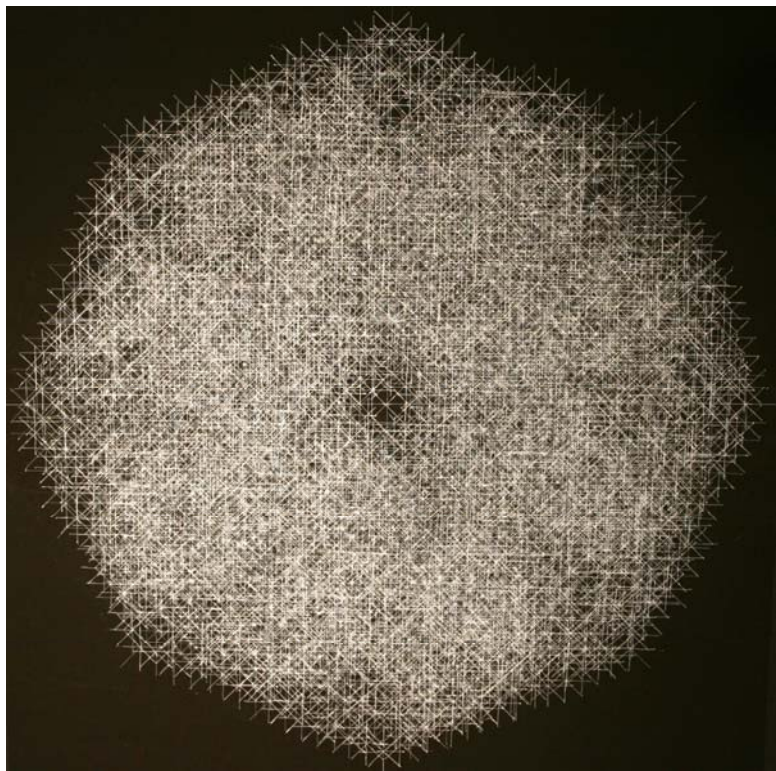


Figure 1: *Drawing for Chaos Night video*