

the many worlds of math art by Stan Gudder

These are works of mathematical art, in other words, **graphic art based on mathematical principles**. The various shapes and figures are obtained by graphing functions in 3-dimensions using the software program Mathematica. I believe that the beauty of these figures results from the fact that they contain an underlying mathematical structure. These are not just random shapes, their underlying structure imparts qualities of symmetry, order, balance, proportion, pattern and periodicity. Some of the artwork appears at first to be 2-dimensional but then the third dimension springs out before the eye. Various mathematical principles such as perspective, geometry, optical illusion, duality, convexity/concavity and infinity reveal themselves. The viewer sees new and unexpected shapes unlike anything on our planet. There appear to be figures, insects, flowers, vegetation and landscapes that belong to other mathematical worlds. Some of these worlds exist only in our imagination while others have a practical reality because they are governed by mathematical equations that are used in applications.

Although I believe these works are a form of art, they are also related to experimental science. They represent an exploration of mathematical functions. A function is a transformation that associates points in a domain set with points in a range set. Not all functions give pleasing results and some functions are more interesting in parts of their domain than in others. **Experimenting with various functions and exploring them over different values of their domains are essential ingredients in these creations.** The colorations of the figures are also generated by mathematical functions and again considerable experimentation is involved. Moreover, I have experimented with various types of paper. Some of the works seem to be better suited for glossy paper and others are more pleasing on a matte finish. I have also found that by removing the mesh lines on the figures, I can obtain a softer, watercolor effect. This is in contrast with the sharp and exact lines of a mesh. Another alternative is to vary the number of plot points of a graph. More plot points give a rounder continuous effect while fewer plot points give a geometric effect. **The works presented here are a very small part of an infinite universe.** This is because there is an unlimited number of functions and colorations to explore and the many worlds of math art are unbounded. In summary, this work is a form of electronic media that represents a synthesis of art, mathematics, computer science and experimentation.



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