

**The Edge of Chaos**  
**The Mathematically Generated Images of Bill Ralph**

Mathematicians in the early twentieth century began looking for ways to describe exotic sets of points such as fractals and chaotic dynamical systems. For example, leaves that are close together in a turbulent river will soon be separated and follow very erratic and essentially unpredictable paths. In order to investigate this chaotic behaviour, Brock University professor of mathematics Bill Ralph wrote a computer program to help him visualize what is known as the "Hausdorff Dimension" - a way to accurately measure the dimension of complicated sets such as fractals.

Ralph became fascinated by the idea of using algorithms to generate abstract images. From early, simple graphic illustrations of mathematical models, he proceeded to create images of increasing complexity. He strove to create images possessing qualities not normally associated with formula output such as subtle textures and blends and apparently spontaneous or randomly generated shapes. Ralph assesses each image for aesthetic interest, adjusting the algorithm to achieve a final satisfying result. The completed image, which may in the end constitute a 500 megabyte file size, is then output as a Giclee print.

An artist looking at a print-out of one of these first images once asked, "Who painted this?" It is perhaps not surprising that some of the images have a painterly feel to them since the mixing of paint on the palette and the action of the brush on a surface are both processes that can be modeled as chaotic dynamical systems. In a sense, each image is a window into the intersection of the two great universes of mathematics and fine art. It has taken Ralph many years of experimentation to acquire the techniques used in the images in this show in part, he says, "because the process is very much like creating a sculpture from a pile of leaves by blowing on them."

Gordon Hatt