

IN THE HANDS OF A MASTER

Fractal analysis has been used to assess the authenticity of paintings purporting to be the work of Jackson Pollock. Alison Abbott reports.

Jackson Pollock, famed for his 'poured' paintings, was defiant in facing down the cynics who viewed them as random splatterings. "I can control the flow of paint; there is no accident."

And several decades after the abstract expressionist's death, science proved him right. In the late 1990s, physicist Richard Taylor analysed a selection of Pollock's poured paintings and found they were composed of distinct fractal patterns — made by dripping or pouring paint straight on to a canvas. Indeed, it seems that 'Jack the Dripper' was refining the fractal characteristics of his paintings long before the mathematics to analyse them was invented.

Now, Taylor's evidence may prove critical in determining the authenticity of a group of recently discovered paintings that could be Pollocks. Given the financial implications, the physicist admits that he had to steel his nerves when writing his report. "This is a high-stakes game," says Taylor. "A Pollock poured painting can be sold for millions of dollars." In 1998, for instance, *Blue Poles: Number 11, 1952* was valued at US\$40 million. So Taylor knew that a negative result — if added to the doubts of Pollock experts — could strip many zeros from the value of the haul.

When the discovery of 32 possible Pollocks was made public in May last year it caused an immediate sensation. Pollock, an alcoholic who had a chaotic lifestyle and eventually died in a car crash, bartered several of his works for groceries. So it is likely that some of his paintings remain to be discovered. But although many claims have been made, only a small number of major poured paintings were formally authenticated before 1995 — when the Pollock-Krasner Foundation, set up under the will of Pollock's widow, Lee Krasner, disbanded its authentication board.

The provenance of the 32 paintings seems convincing. Alex Matter, son of the photographer Herbert Matter and painter Mercedes Matter, who were close friends of Pollock, found the works among a jumble of his parents' belongings. Labels in his father's handwriting identified them as paintings done by Pollock in the 1940s that he had acquired as 'gift + purchase'.

Alex Matter showed the works to the art dealer Mark Borghi, who in turn contacted Ellen Landau, a Pollock expert who had served on the Pollock-Krasner authentication board. Landau is now involved in preparing an exhibition called *Pollock Matters 2006*, which is being organized by Borghi and Matter to celebrate the 50th anniversary of Pollock's death.

The new poured paintings will play a key role in the show, and Landau will outline their significance in Pollock's career.

But other art historians have disagreed — some angrily — with the idea that the pictures are Pollocks. The doubters include Francis O'Connor, co-author of the definitive Pollock catalogue and another member of the authentication board, while it existed.

Given the high-profile dispute, and the large numbers of paintings involved — Taylor says they could represent up to a tenth of the significant poured paintings Pollock is known to have produced — the Pollock-Krasner Foundation decided it needed to get involved. It also decided that it required a more objective approach to authentication than the conflicting opinions of art historians could provide, especially if its judgement came to be challenged in the courts.

Traditionally, the authentication of a painting relies heavily on experts' visual assessments, supported by analysis of materials used in the work and knowledge of where it came from. "Art experts find it very stressful to make

"Pollock was honing his fractals a quarter of a century before they were defined."

judgements based on visualization alone," says Taylor. "They feel a bit let off the hook when materials or provenance can help."

But analysis of materials is of limited help in identifying true Pollocks, as the painter used common, off-the-shelf paints. And after *Life* magazine published a feature on Pollock and his sensational new approach to art in 1949, many readers tried their hand at his abstract expressionist style.

Although the provenance of the 32 paintings looks compelling, sceptics argue that the works could have been painted by Mercedes Matter, imitating Pollock's style. The fact that the poured paintings are on the type of board that Matter typically used, rather than Pollock's usual canvas, supports this argument, they say. The counter position is that Pollock

probably tried his method on Matter's boards because the two were so close.

So the foundation discreetly approached Taylor to act as a more objective arbiter, sending him six of the paintings to analyse. "From my point of view it was a good opportunity, as I was able to apply my research in the field," says Taylor.

Back in the late 1990s, Taylor, who has a degree in art theory as well as physics, decided to pursue his suspicion that Pollock's pouring technique could be described using fractal geometry. Fractal patterns, which repeat themselves at different magnifications, are often associated with chaotic systems. During the 1970s, mathematicians used chaos theory to reveal fractal patterns in natural objects such as coastlines, trees and flames.

There were two reasons to suspect that Pollock's paintings might obey fractal geometry. Moving around a large canvas laid on the ground, the artist let paint fly from all angles, using his whole body. Human motion is known to display fractal properties when people restore their balance, says Taylor, and films of Pollock seem to show him painting in a state of 'controlled off-balance'. Second, the dripping and pouring itself could be a chaotic process.

While continuing his research on nano-electronic devices (which display fractal patterns in their electrical properties), Taylor set about looking for fractals in five Pollock poured paintings in his spare time. He placed computer-generated grids over photographs of the works, and found two distinct sets of fractal patterns. One was on a scale larger than 5 cm; the other showed up on scales between 1 mm and 5 cm (R. P. Taylor, A. P. Micolich and D. Jonas *Nature* 399, 422; 1999).

"Pollock was in control," says Taylor. The large-scale fractals are a fingerprint of the artist's body motion, he notes. "But the small-scale fractals are also to do with his choices — his height over the canvas, the fluidity of his paint, angle and force behind the trajectory, and so on."

Taylor also found that the fractal dimension of Pollock's works — a value that describes the complexity of a fractal pattern — increased through the years as the artist refined his technique. It seems that Pollock was honing his ability to generate fractals a full quarter century before fractal geometry was formally described.

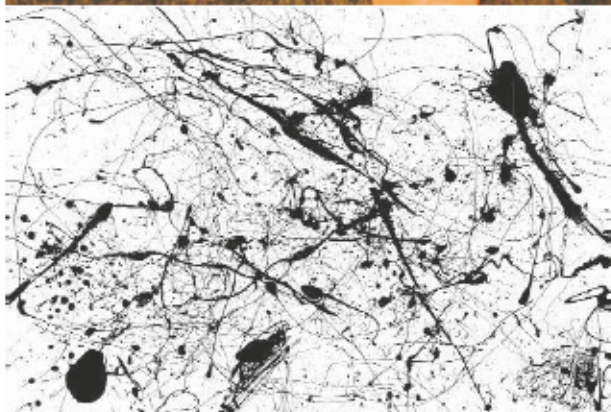
When he moved to the University of Oregon in Eugene in 2000, Taylor began a more comprehensive analysis to determine whether these fractal patterns were unique to Pollock. He used every last bit of information about the artist he could find, studying movements in a 1950 film of Pollock at work, and even the

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PATTERN RECOGNITION LETTERS



Truth and beauty: Richard Taylor compares the fractal characteristics of possible Pollocks with the real thing (see previous page) and student daubs (left).

splatters of paint that had missed the targeted canvas and landed on the floor, as recorded in old photographs. In total, he analysed 14 Pollock paintings, 37 imitations created by students at the University of Oregon and 46 poured paintings of unknown origin.

The genuine Pollocks had been painted in several ways — sometimes the artist flicked paint from a brush or stick; on other occasions he let the paint run down a brush or stick to fall on the canvas; sometimes he poured directly from the paint tin, or punctured holes in tubes of paints and squeezed them directly on to the canvas. Yet all had the same group of fractal characteristics. “The only shared thing in Pollock’s very different poured paintings is a fractal composition that was systematic through the years,” says Taylor.

Although the other poured paintings did include fractal patterns, none of them shared this particular group of fractal characteristics — and neither did Pollock’s accidental floor splatters. Dan Rockmore, a mathematician

from Dartmouth College in Hanover, New Hampshire, has also searched for statistical signatures in art, in the works of painters such as Pieter Bruegel the Elder. He describes Taylor’s findings as “extraordinarily clever”.

The six paintings from the foundation arrived a year after Taylor submitted a paper describing these results to *Pattern Recognition Letters*, which has since been accepted for publication. Applying the same statistical techniques to these works, he found that “I found significant deviations from Pollock’s fractal geometry he had observed in Pollock’s work. “I found significant deviations from Pollock’s characteristics,” says Taylor.

“Taken in isolation, these results are not intended to be a technique for attributing a poured painting to Jackson Pollock,” he wrote in a report to the Pollock–Krasner Foundation last July. “However, the results may be useful when coupled with other important information

such as provenance, connoisseurship and materials analysis.”

There were months of silence after Taylor delivered his confidential report. Given the high stakes for the art world, the foundation wanted to continue research on the provenance of each of the 32 paintings before giving a definitive thumbs-up or thumbs-down. Inevitably, rumours began to circulate — in the past few weeks, they have prompted Borghi himself to request Taylor to analyse a selection of the paintings. Borghi says he sees a lot of merit in what Taylor does, although he doesn’t believe authentication should rely on fractal analysis alone as painters often paint things out of style.

The foundation has now decided to go public with the results of Taylor’s study, while withholding a final, formal judgement. O’Connor, of the authentication board, pronounced his satisfaction that the findings “reinforce my own scepticism and reservations”. The foundation is choosing to pursue a consensus among Pollock experts; a draft statement seen by *Nature* calls Taylor’s results “a valuable contribution to our investigation”.

The results may be enough to cast doubt on the value of Matter’s finds, at least until there is a final ruling from the foundation. Confidence in pattern analysis in art authentication is on the increase — which is partly why the foundation commissioned Taylor in the first place. And in the world of finance, whether it’s coffee, gold, or artworks, it is confidence that drives market prices. ■

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