The Drunken Conversation of Chaos and Painting

James Elkins

A revision of this was published in *Meaning* 12 (1992): 55–60.
This material was originally posted on www.jameselkins.com.
Please write jameselkins@fastmail.cn with comments or suggestions.

Chaos theory and its relative fractal geometry are new kinds of physics and mathematics that are strongly visual. The swirling, "paisley" patterns and "biomorphs" that are familiar on calendars, postcards, and computer screens are drawn by the computer in the same way that a parabola or a circle is drawn by a High School geometry student—except that the calculations necessary for detailed fractal forms are beyond human capacity. Both the parabola and the fractal "bug" are drawn against "x" and "y" coordinates, following relatively simple equations. (The intricacy of the fractal is not due to the equations themselves, but to the way they are calculated over and over, by "iteration.") Most of the attention in the technical literature is focussed on the properties of the equations or on their applications. But neither the scientists nor the mathematicians are free of artistic purpose, and they alter and enhance the bare mathematics in order to make their printouts into aesthetically pleasing pictures. That artistic overlay is signifi-

cant for a number of reasons. The scientists who create the images tend to have an unsteady grounding in the history of art, and they draw on a nascent and uncognized aesthetics to choose and arrange their images. Writers in the humanities therefore experience the new geometry at a double remove, since they see the forms without their mathematical meanings, and with an overlay of colors and compositions that are not dictated by the equations.

My interest here is not in exploring the properties of the new geometry—which I think can only be studied along with the relevant mathematics—but in assessing the quality of the exchange that is taking place between science and art. Despite the growing literature, it can be argued that neither side sees the other in a clear light. The scientists and mathematicians who generate the images are at times unaware of the expressive meaning of their creations; and the artists and critics tend to rewrite the nature of fractals in order to fit them into artistic discourse. There are two strange attractors involved in this conversation: one, the seductive world of art, aligned, as it seems to those outside it, with "culture," "meaning," and a host of ghostly values. The other, the forbidding world of mathematical physics, empowered, so it seems to those outside it, with a wondrous new way of understanding the world. What I would like to do here is to describe this conversation as it is currently unfolding, without taking sides or prescribing ways that it might be "improved." It seems particularly interesting to me that science and art speak in this strange way: each is enamored of the other, and like lovers in a comedy, they imagine the object of their attention in whatever way seems best to them. At the close I will have a few words to say about the meaning of their odd dialogue.

Within mathematics, there is no question of the importance of the new discoveries. The "new geometry" knows itself to be fundamental: "Euclid," Benoit Mandelbrot announces in *The Fractal Geometry of Nature,* will be "used in this work to denote all of standard geometry." The unexpected efflorescence of geometry, so difficult to follow through its growing associations with physics, biology, astronomy, geology, medicine, and economics, already has wide experimental support and applications as diverse as the threebody problem, population dynamics, the neurobiology of hearing, and the contractions

of heart muscle. It has, in addition, serious philosophic and experimental implications for the scientific method itself.

In this context the "new geometry" is most interesting because it knows itself to be beautiful, though the nature and extent of that knowledge are open to question. Mandelbrot quotes an article in *Science* that makes a parallel between cubism, atonal music and modern mathematics beginning with "Cantor's set theory and Peano's spacefilling curves." He sees a rococo phase in mathematics before the modern era, followed by a visual austerity. When it comes to art, he makes a poorly articulated and unconvincing historical and aesthetic reading of his own fractal inventions, according to which the extravagant, ebullient forms he has visualized are "minimalist art"—a most unlikely identification. There is also an unwillingness on Mandelbrot's part to mix art and science: when computer printouts are to be judged aesthetically, he gives them selfparodistic titles such as "The Computer 'bug' as artist, Opus 1," thereby publishing aesthetic results as mistakes, "bugs" in programs. Part of the meaning of such titles resides in Mandelbrot's mimicry of contempory painting styles; "Opus 2" is like an angular Clifford Still or Franz Kline. He also thinks his polychromic computer printouts are "austere." The reason is they have simple mathematics behind them, and so his misidentification with minimalism is an example of non-visual thinking—what a mathematician would call "analytic" rather than "synthetic" reasoning. More plausibly, he thinks a Mies van der Rohe building is a "scalebound" throwback to "Euclid" since it has only certain classes of forms, while—in a particularly strange juxtaposition of cultures—"a high period Beaux Arts building is rich in fractal aspects."

Meanwhile, mathematicians such as H.-O. Peitgen "wrap" fractal images around spheres, so their computers can generate "moons" and fantasy spacescapes that are less like the tongue-in-cheek graffitti of Kenny Scharf than they are like the serious kitsch of the *fin-de-siècle*. Computer palettes continue to be set in psychedelic, hokey, holographic, iridescent, heavy-metal combinations. (Colors are not part of the mathematical properties of fractals. They are chosen at will by the programmers.) The aesthetic values of the mathematicians are circumscribed by the domain of fantasy, especially medieval revival and late twentieth–century primitivism, and their formal strategies devolve from unacknowledged sources in Ger-

man romanticism. They are anything but postmodern, though the artists that admire the new geometry often are.

But if science cannot find a contemporary taste to match its new geometry, the art world has not done much better in understanding what the mathematicians are saying. The art critical discourse is marked by misuse of mathematical terminology, a love of catchwords, and the construction of more or less tenuous metaphorical bridges between the concerns of the humanities and the claims of the new geometry. The lexicon of this *scienza nuova* rhymes with terms already given us by post-structuralism: chaos theory, chaotic dynamics, fractal, fractoid, fractal dimension, rupture, elementary catastrophe, laminar flow, turbulence, irregularity, imbalance, iteration, self-similarity, spikes, dwell bands, connected sets, and a host of eponymous attractors (Rössler's, Lorenz's, Ueda's), all resonate with figures already at use in contemporary visual theory and literary criticism. (At the same time, the mathematicians give their creations hokey, space–age names: seahorse alley, fractal popcorn, fractal dust, midget, satellite, antenna, bushy structure, polymer glue, hysterical cycle, blue sky.)

Carlo McCormick, in an article on Mark Tansey, describes Feigenbaum and Mandelbrot as "epic theoreticians of the new multidimensional perspective," a double misnomer: the new geometry is emphatically not "perspective" in either sense of the word; and it deals with fractional, and not multiple, dimensions. Maybe fractal geometry is "the disarming of the comfort of order," but it isn't "the introduction to a terrain of neither fixed absolutes nor absolute disorder"—unless one would want to claim relativity sides with order. In scientific terms, "order's loose ends" don't "refract into chaos." Nor does chaos theory teach "rational irrationalism," the "void of disorder," or the "turbulence of conflict."

Slavoj Zizek's *Looking Awry* describes a swirling, wreath-like strange attractor as an "'anamorphotically' disfigured circle." This usage takes anamorphosis (as in his title) and the misspelled word "anamorphotically" (the usual form is "anamorphically") from Jacques Lacan's description of the gaze, and brings them into a context in which they have no mathematical meaning. Anamorphosis has resonance with other passages in *Looking Awry,* but it is interesting that Zizek does not find it necessary to remark either on the meaning of the new spelling, or on

the absence of any projection in chaotic dynamics that might give the term mathematical sense. This particular kind of ruptured context is often accompanied by "risky" homologies (the word is Zizek's), and in this case he draws a parallel between the opposition of normal and strange attractors and "the opposition between the balance toward which the pleasure principle strives and the Freudian Thing embodying enjoyment." Both neologisms and "risky" homologies function by eliding scientific context, and the rules of those elisions are not carried over to quotations and descriptions from the humanities. Freud or Lacan, for example, are described in such a way as to reverse or efface the meaning of terms such as "pleasure principle" or "Thing." That imbalance, in turn, is not acknowledged in the texts, producing a curious and uncontrolled interplay of lacunae, ample descriptive narration, and sharply broken contexts.

Both the mathematicians and the artists are agreed on one point: that fractal geometry might somehow be applied to painting (or to film or computer graphics) because it models natural forms so well; but even that notion may not be as straightforward as it is assumed to be. On the surface, it is easy to see why some artists and computer graphics experts are intrigued by the potential uses of fractals. It's not just that the new geometry looks like everything in nature from frost ferns to silver trees. It's that it looks so much like older styles of Western and nonWestern painting. In one place, its forms are virtual duplicates for rococo frills and swags such as those in the MillionenZimmer in the Schloss Schönbrunn. Other equations recall *rocaille, Ohrmuschelwerk* (cartouches in the form of ears), arabesques, and even paisley. And there are echoes of the intentional asymmetries of Cozzens and Constable, and the "leaf beauty" of Ruskin. The meteorologist E. N. Lorenz, who helped found chaotic dynamics by discovering the first "strange attractor" in a simplified model of atmospheric circulation, has recently become interested in these associations. One tangle within a larger tangle reminds him of a bird in a thorn bush, but it also speaks of painting, and bears an uncanny resemblance to Chu Ta's versions of *Bird and Rock*. The metaphoric range appears unlimited within the domain of represented and real organic and inorganic growth. In this versatility the new geometry is the opposite of linear perspective, which has the smallest field of correspondences with natural form.

This apparently unlimited applicability may then be contrasted to the near–absence of geometric rules in modern painting. Modern art had long ago "overthrown" linear perspective, which was the traditional theoretical geometric accompaniment of artists' organic improvisations. Postmodernism has long since forgotten that act of forgetting, and for several decades, except in the specialized case of geometric abstraction, painting has been without its traditional geometric foundation. Since chaotic dynamics and fractals are the first theories that purport to account for those nonlinear phenomena that were once taken to be ungeometric and beyond the reach of "Euclid," they have the potential be far more decisive in painting than linear perspective, with its patently artificial rules, could ever hope to be. Potentially the new geometry could "ground" every organic, asymmetric, complex form in painting in a way analogous to the way linear perspective stands behind the the infinite, the isotropic, the mechanical, and the architectonic. In such a scenario the relation between painters and their geometry would also change: artists could no longer escape the heritage of geometry by turning to organic forms like landscapes, and conversely, it would no longer be as clear what would constitute a use or even acceptance of the new geometry, since fractals would presumably remain impractical for drawing (except by computer) and out of the reach of a small set of usable rules. There will be no *Elementary Lessons in Fractal Drawing*.

Mark Tansey has done several paintings with fractal themes. In one, surveyors attempt to measure a wild coastline. Their instruments are no match for their subject, especially since it is itself a gigantic version of a Julia set, one of the derivatives of the Mandelbrot set, a fundamental fractal form. The rocks pun into fractal "seahorses," forming a progression of nearly but not perfectly identical forms. The lowest seahorse, the one behind the female surveyor at the right, epitomizes the new mysteriousness by sporting an implacable sphinx's face; and beneath her hand littler seahorse sphinxes curl away into an undefinable infinity. This is a new way for geometry to be with painting: instead of being "in perspective" or "in" some other geometry, the painting is "about" geometry. Renaissance painters used perspective, but didn't draw pictures *of* perspective. The new approach is selfreflexive, but it is also problematic, since it is not an *application* in the sense that fractals seem to promise. In light of these difficulties it may be that the local successes of fractals in modelling mountains, rocks, ferns, bark, and water are misleading because

the very idea of application, as we have learned it through linear perspective, may have become inapplicable.

I do not mean to promote sobriety, or to say that there is some ideal form of responsible communication between these scientists and these artists. Instead I would like to suggest that we consider the meanings and the potential of our writing on the subject rather than continuing as if the new forms could simply be "applied" to the world or "imported" into art, or as if any metallic enhancement of a computer graph would make an acceptable picture. At the same time it is hard to know what is inappropriate. The relation of perspective, the outgoing geometric standard, to this new source of geometry is problematic and unresolved. It is possible that the mathematicians' dependence on fantasy art and decadent popular illustration might be close to contemporary art in ways that we do not yet appreciate. Nor does it necessarily make sense to emend the humanists' use of scientific terms for distant rhetorical purposes, since that custom is well-attested in the history of Western thought.

The art world imbibes its science instead of facing it soberly, and scientists sidle up to art without knowing quite what to say. In this brief example I have tried to suggest that the various mistranslations may be evidence that the exchange between geometry and painting has not yet run its course. In particular, I would like to read the metaphorization of mathematics by the humanities, and the rewriting of visual history in mathematical terms, as legacies of the unresolved—unresolvable—traditions of linear perspective.

Notes