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Classic economic thought devoid of 'fractal' theory

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Remember fractals? In the mid-'90s, the paisley-like patterns were everywhere, in advertisements, music videos, and on album covers and computer screensavers. Gearheads, geeks and graphic designers were grabbed by the psychedelic forms, which seemed both otherworldly yet oddly familiar. You still see them around, as in the opening credits for the sci-fi television series Defying Gravity.

A fractal is "a rough or fragmented geometric shape that can be split into parts, each of which is (at least approximately) a reduced-size copy of the whole," noted mathematician Bernard Mandelbrot, who coined the term "fractal" back in 1975 from the Latin fractus meaning "broken" or "fractured." And in our fractured age, we can still learn a lot from these bizarre geometrical entities.

Last week, I sat down to rewatch Arthur C. Clarke's 1997 BBC documentary, The Colours of Infinity (a jaw-dropper you can catch online at Google Video). With Clarke's guidance, and '90s-era supercomputers pushed to their limits, the viewer descends into the infinitely complex form of the Mandelobrot set, the most famous fractal of all, with its tendrils of nonrepeating complexity emerging under increasing magnification.

Scientists couldn't properly visualize these patterns until the '80s, when computers became powerful enough to show them emerging from millions of mathematical operations. The discovery heralded the beginnings of fractal geometry systems and other programs that led to increasingly life-like simulations in movies and computer games. Fractal landscape programs have been used in everything from Return of the Jedi to retail software programs like Bryce.

More importantly, scientists discovered that only a small fraction of all phenomenon in the universe are "linear," or predictable in principle. The rest are "nonlinear," chaotic and complicated, which is in keeping with the world as we experience it. Fractals are the Rosetta stone for decoding nature's complexity. They can resemble the interweaving motifs on Persian rugs, the repetitive patterns of ferns, the branching networks of rivers or the human circulatory system. The similarity is not accidental. Real-world mountain ranges, trees, coastlines, clouds, and hundreds of other natural phenomenon all have fractal-like appearances and properties.

What makes fractals like the Mandelbrot Set special is that their infinite complexity is based on very easy-to-understand rules, in which a simple equation is repeated over and over. The solution becomes the input for the next operation, and so on. This snake-swallowing-its tail procedure is called "iteration," and this is pretty much how life on Earth operates. The biosphere is an immense, iterative processor in which the output from natural processes--decaying organic matter, oxygen from plants, and carbon dioxide from animals--becomes the input for successive generations of living things.

So what's my point, you ask? Fractals, and the sciences of chaos theory, have utterly demolished previous ideas about how the world is organized--and I submit that includes the quaint, materialism of classical economics. Yet most of the "dismal science," as it's taught at the undergraduate level, still persists in treating the environment as an "externality." In other words, the feedback loops from the environment to the market are not part of economic modelling, although they are in fact part of the very fabric of reality.

The blinkered, pseudoscientific thinking of classical economics is largely responsible for the mess we're in today. An oil spill or a heart attack counts as a plus in GDP projections, and financial derivatives are capable of undoing the very markets their makers are trying to game. Even though there are no "externalities" in the real world, many economists and policy makers have persisted in treating the planet as some strange combination of pinata, latrine and slot machine. If and when we run out of resources, the market will magically find new ones, they say. That's the mantra of unregulated free markets.

Barry Commoner's First Law of Ecology, that everything is connected to everything else, is echoed visually in fractals' delicate filigrees. That's the lesson these mathematical marvels offer us. The longer we persist in thinking of ourselves as isolated consumers, or "self-interested utility maximizers," as some economists put it, the greater our denial of a chaotically complex world and the iterative, interconnected beauty of all living things--ourselves included. Fractals 'R Us.

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