Natural Questions: Chaos Theory Seeps Into Ecology Debate, Stirring Up a Tempest

If Nature Is Not Governed By an Ultimate Order, What's the Place of Man?

Pride and Secular Humanism

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LAWRENCE, KAN. — Nature herself is at the window—rattling the panes, roaring in the treetops, shading inside to rustle the scholarly papers on Donald Worster's desk. The gale seems bent on rearranging the very thoughts of the papers contain. Another, metaphorical gale is roaring through the fields of scholarly thought about nature and, by extension, threatening the confident progress in biology that has informed Western thought for centuries. This storm is the special province of Dr. Worster, a nationally recognized environmental historian here at the University of Kansas. He and others see one of history's great intellectual upheavals unfolding. It amounts to a reshap

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of the thought-world that Western man inhabits like a turtle in its shell. At bottom, these observers see the breaking up of secular, rationalist humanism, a philosophy that germinated during the Renaissance, reached full flower in the 18th-century Enlightenment and still permeates Western culture today. Progress is the promise of humanism; reason is its tool.

Through reason, man would discover the "laws of nature." If man could just know enough and apply, that knowledge, things would get better and better. But now doubts are eroding this secular faith. Nature, once viewed as inherently orderly, is coming to be viewed by many (although certainly not all) scientists as inherently disorderly. And human history, once viewed as something that rational man could bend to his liking, is increasingly viewed as a force unto itself.

If you give nature a name, it winds up looking a lot like human history," Dr. Worster says as the wind buffets his campus office building. "Change is the norm. Disturbance is the norm. The world is nothing but flux and flow. Nothing but flux and flow. Change without end, change that doesn't necessarily "progress" toward anything. In ecology, in history, in psychological outlook—ours, Dr. Worster has written, is a "postmodernist, poststructuralist age, when all that has seemed solid melts into the air..." What is melting into the air is the old paradigm: a faith, really, that explained the way the world worked. One of the things underlying that faith now is the scholarly emergence of chaos theory, which holds that many complex phenomena are inherently unpredictable.

But the dramatic change in scholarly thinking ultimately reflects something much broader: a fundamental shift in the larger culture. As it is often pointed out during the New Deal, ecologists talked of a forest in terms of "communities" of plants—while, by the Reagan era, they were likely to describe it in terms of plants as competitive entrepreneurs (or in Dr. Worster's words as "nothing but a temporary gathering of strangers")? Is it a coincidence that 1950s movies portrayed a world beautifully progressing through the miracles of science, while four decades later "Jurassic Park" portrayed a terrifying world of science run amok? Observers like Dr. Worster think not, and the sea change they sense goes beyond science to raise questions about ethics and morality.

As Dr. Worster asks in an essay: "What is there to love or preserve in a universe of chaos? How can one help it to behave in such a universe? If that is the kind of place we inhabit, why not go ahead with all our private ambitions, free of any fear that we may be doing special damage?"

Other thinkers, ranging from social commentators to physicists, are asking the same basic questions. They are a diverse lot, of course, and far from agreement on many points. But listen to some of them and one can almost hear the old thought-world dying and the new world—less confident, less certain of itself—being born.

Irving Kristol, a fellow at the American Enterprise Institute, talks of "a shaking of the foundations of the modern world." He is convinced that "we are at a unique moment in Western culture, the collapse of secular, rationalist faith."

Of course, religious traditionalists have long warned against the philosophy of secular humanism, even prayed for its collapse. But now critiques of that philosophy seem to be spreading among scientists as well. One such critic is Rutgers University biologist David Ehrenfeld, author of the book "The Arrogance of Humanism." In his book he acknowledges that human-.
Questions: Chaos Theory Seeps Into Ecology, Its Humanistic Notions of Order and Progress

From First Page:

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Holocaust and the ethnic wars of today, battered the faith among social scientists.

"The hope was that if you made people rich through science they would be less con- sumed by passions like rape and murder," observes Mark Sagoff, director of the Uni- versity of Maryland's Center for Philo-

sophy and Public Policy. But hate and anger have turned out to be deeply rooted, and deeply satisfying, things. "Revenge of the ancestors or spreading the true faith along the lines that is the kind of thing that can motivate a 19-year-old to throw a hand grenade," he says.

Meanwhile, the faith has been eroding among physical scientists as well — a long, slow process whose implications have sometimes troubled the very thinkers whose thoughts advanced it in the first place. As early as the mid-1920s, German scientist Werner Heisenberg formulated the "uncertainty principle." In layman's terms, the principle holds that it is impos- sible to get a perfectly precise measure- ment of even a relatively simple thing—his example was the position and velocity of a particle — because the very act of measur- ing subtly distorts the thing being mea- sured. And without an absolutely precise measurement, it is impossible to predict with certainty how that thing will behave in the future.

Playing Dice

For a scientist or a philosopher this is at best humbling — and at worst terrifying. Even Albert Einstein, whose own thinking built upon the uncertainty principle, re- called against its ultimate implication: a universe governed by chance. "God does not play dice," he protested.

Or does he? Chaos theory, a more recent but equally unsettling development, holds that the long-term behavior of a system (the weather, for example, or the universe itself) cannot be predicted with certainty unless the initial conditions of that system are known to an infinite degree of accuracy — which is impossible. Never- less, one of the most brilliant minds of the 20th century, British theoretical physi- cist Stephen W. Hawking, is more optimis- tic.

In his book "A Brief History of Time," he argues that it may well be possible to create a holy grail of physics, the "unified theory" — and with it, the "ulti- mate theory of the universe." Still, this relative optimism is tempered by a built-in sense of limitations. Even if the unified theory is discovered, Dr. Hawking writes, it would seem an absolutely precious penta- mannered roadblock to man's ability to ever predict events in general.

Clearly, something has eroded away over time: The supreme confidence — or hubris — that characterized earlier eras of Science. Dr. Worster, the University of Kansas historian, has examined this er- osion during the 20th century by using the science of ecology as a prism. Ecology, as defined by ecologists themselves, has changed radically in recent decades. As Dr. Worster has written with some dismay, it has metamorphosed from "a study of equilibrium, harmony and order" into "a study of disturbance, disharmony and chaos."

What intrigues him is why.

Donald Worster, at 52, has the deliber- ate, reflective manner of the scholar he is. He won the Bancroft Prize in 1980 for his book "Dust Bowl." But his beard and rakish Snowy River has suggest another side of his nature: a consuming interest in the outdoors and the American West. He grew up on a Kansas farm, and some of his fondest memories are of fishing along Cow Creek. There, Cow Creek wasn't much, as streams go. But it was a ribbon of wildness in a landscape shaped by mechanized agri- culture, a connection to a larger natural world of sun and wind and sky. That is the kind of wildness with which now, the wildness—the aliveness—of that place. In good measure, it explains why he thinks of himself as a conservationist.

Dr. Worster begins his story with an early ecologist, Frederic L. Clements, whose ideas have influenced ecological thought since the turn of the century. His central thesis was that nature, if left alone by man, would inexorably progress from disorder to order, from "lower" to "higher" forms of organization.

Suppose, for example, some great force erased the virgin prairie of Mr. Clements's native Nebraska, returning the land to a blank slate. The Clements theory held that the bare earth would initially be colonized by tough but weedy "pioneer" plants. The pioneers would set the stage for something better, an intermediate plant community which, in the fullness of time, would prepare the way for the noble mix of grasses and wildflowers that existed originally.

Mr. Clements regarded this final stage, called the "climax" community, as self-sustaining and self-replicating. Indeed, to him, the concept verged on mystical. He called it a "superorganism," implying that the individual plants had, in some sense, fused into a single coherent being. Echoes of this live on among some environmentalists today in the so-called Gaia Hypothesis; it holds that an ancient forest, for example, has something—call it a soul, perhaps—that a tree farm simply doesn't.

To Dr. Worster, the striking thing is how closely the Clements paradigm echoed the themes of progress that dominated American history at the time. Instead of pioneers in Conestoga wagons, preparing the way for cities and industrialists, Mr. Clements had plants. But the end result in each case was the same: "civilization."

Then something began to happen to this early optimism. The change was small at first. In the 1950s, ecologist Eugene P. Odum popularized a concept that, even today, remains the underpinning of the environmental move- ment: the concept of the ecosystem. Al- though a step back from Mr. Clements's "superorganism," this concept still re- tained his core thesis. Nature remained a complex of communities, each progressing toward harmony. "Odum gave the impres- sion that nature was 'love thy neighbor,'" says Dr. Worster. Indeed, his view seemed to reflect his philosophy of life as the son of a New England Congregationalist who believed in a human community progressing toward ra- cial harmony.

But by the mid-1970s, ecologists, with their scientific training, had begun to distance themselves from environmental- ists (and their "climax" and "pioneer") and their holistic, reformist and ultimately moralis- tic approach to nature, Dr. Worster says. They had begun to doubt nature was progressing toward anything in particular. In their studies, those scurvy pioneer plants didn't so obligingly yield to something "higher" and "better." They hung stubbornly until some random disturbance — a fire or flood — dislodged them. The notion of randomness, of chaos, was moving into ecological theory.

At the same time, Jordanian ecologists were also moving, in a sense, from New Deal thinking to Ronald Reagan thinking. Instead of viewing a prairie or a forest as a love-thy-neighbor co-op, they increasingly viewed it as an atomized collection of competing organisms. Paul Colvin — in his 1978 book "Why Big Fierce Animals Are Rare," caught the spirit of the change. Individual plants, he wrote, were "earning their living as best they may." What looked like a community was merely the "summed results of all these bits of private enterprise," he wrote.

Today, some observers detect a counter- trend in "restoration ecology," a trend paralleling the 1990s reaction against the "Great Society" movement. It represents a belief by a growing body of ecologists that nature sometimes needs a hand in re-establishing an ecosystem's "highest" and "best" use. "Restoration is a ritual of hope," says the University of Wisconsin's William I. III, editor of Restoration & Management Notes.

Donald Worster, as a conservationist, finds the counter trend encouraging. But he doubts there is any go back to the "optimistic approach" — to the underlying as- sumption of wholeness and a charitable view of earlier ecologists and historians. "It becomes harder and harder," he says, "to see some sort of natural order and balance and harmony out there.

He can sense the change in himself. Although "fairly hopeful" that human be-ings will survive, he is "deeply pessimis- tic" about the prospects for uncounted other species. "The heritage of evolution, the beauty and the intricacy" — that is all but com- pletely lost, he says, like Frederic Clements once talked confidently of the whole, Dr. Worster worries about saving the pieces.

The gale roars on, its fury unabated. Wildfires are breaking out in the Kansas, country-wide. It's a very good day for anyone who believes, or wants to believe, in har-mony and order and a history that pro-gresses inexorably from bad to good to best. "If you ask me what a historian is, I would say a storyteller," muses Dr. Wor- ster. "One way we work is we know what the story was. In American history, in na-ture — we had a story. Today there's just enormous uncertainty about the narra-