

Fractal Economies: Learning from the Biosphere

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How we humans can redesign our failing systems by turning back to nature—and learning to live by the rules of life

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Our favorite definition of life comes from evolutionary biologist Lynn Margulies: “Life is matter with the capacity to choose.”

The intricate self-organizing structure of Earth’s biosphere is the product of life’s extraordinary 3.5 billion year evolutionary quest to explore and expand the possibilities of its capacity to choose. The result is a complex and highly sophisticated **fractal structure** of nested, self-reliant, progressively smaller-scale ecosystems, each exquisitely adapted to its particular place on Earth to optimize the capture of energy to sustain matter in a living choice-making state.

To this end, trillions upon trillions of cells, organisms, and communities of organisms engage in an exquisite continuing dance of cooperative exchange. Each participant in this dance maintains its own identity and vitality while contributing to the needs of its neighbors and to the balance, stability, and resilience of the whole.

We humans, with our extraordinary capacity for choice, are a product of this wondrous process. In our species' immaturity, however, our dominant cultures have forgotten that our individual and collective well-being depends on the well-being of the whole. We must now step to a new level of species maturity, redesign the culture and institutions of our economic system to mimic the structure and dynamics of the biosphere, and learn to live by life’s rules. It is an epic test of our human capacity for learning, creative innovation, self-organization, and individual and collective choice.

The following are three defining characteristics of the **Fractal Systems** our human economies must emulate.

1. Cooperative Self-Organization: Ecosystems have no central control structure. Their health and vitality depend on processes of cooperative self-organization in which each species learns to meet its own needs in ways that simultaneously serve the needs of others. The more diverse and cooperative the bio-community, the greater its capacity to innovate and the greater its resilience in the face of crisis.

2. Self-Reliant Local Adaptation: The biosphere's cooperatively self-organizing structure supports a constant process of adaptation to the intricate features of Earth's distinctive local microenvironments to optimize the capture, sharing, use, and storage of available energy.

Local self-reliance is a key to the system's ability to absorb and contain most system disturbance locally with minimum overall system disruption. So long as each local subsystem balances its consumption and reproduction with local resource availability, the biosphere remains healthy and dynamic.

3. Managed Boundaries: Because of the way life manages energy, each living entity must maintain an active flow of energy within itself and in continuous exchange with its neighbors. Life requires permeable managed membranes at every level of organization—the cell, the organ, the multi-celled organism, and the multi-species ecosystem—to manage these flows and as a defense against parasitic predators.

If the membrane of the cell or organism is breached, the continuously flowing embodied energy that sustains its living internal structures dissipates into the surrounding environment, and it dies. It also dies, however, if the membrane becomes impermeable, thus isolating the entity and cutting off its needed energy exchange with its neighbors. Managed boundaries are not only essential to life's good health; they are essential to its very existence.

These are foundational design principles for the cooperative, self-organizing, self-reliant adaptive fractal economies on which our human future depends. The institutional structures of fractal economies facilitate joyful non-monetized exchanges of life energy based on relationships of trust and caring—the social capital of vital cohesive living communities.

Reorganizing our human economies to function as locally self-reliant subsystems of our local ecosystems will require segmenting the borderless global economy into a planetary system of interlinked self-reliant regional economies. This does not mean shutting out the world. Vital fractal economies exchange their surplus goods for the surplus goods of their neighbors and freely share ideas, technology, and culture in a spirit of mutual respect for the needs and values of all players.

In a fractal economy, the rights and interests of living communities of living, breathing people engaged in a living exchange with the natural systems of their bioregion properly take priority over the presumed rights of artificial corporate entities that value life only as a marketable commodity and operate by the moral code of a malignant cancer. Protecting the boundaries of the community from intrusion by predatory corporations is an essential function of any responsible government.

We humans are the most advanced expression of life's capacity to choose. We must now demonstrate our ability to use that capacity wisely.