



The Biology of Business

New Laws of Nature Reveal a Better Way for Business

By Elisabet Sahtouris, Ph.D.

At the *Be The Change* conference in London in May, it seemed that the majority of speakers ultimately referenced and inevitably honored one person, Elisabet Sahtouris, who blushed uncomfortably in the audience.

This concluding article proves exactly why so many renowned thinkers, from spiritualists to scientists to economists, mention her name. She takes us on a Baedeker-clear magic carpet ride over billions of years of evolution, and as we land she bestows us with eight practical recommendations we can follow to make our businesses more successful, using the self-same principles that have organized natural systems — much more complex than anything IBM could conjure — since the dawn of time.

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From Competition to Cooperation

My own work as an evolution biologist shows a very different picture of How Things Are in Nature and in our human world. Once I adopted Maturana and Varela's definition of life as autopoiesis—that a living entity is one continually creating itself in relation to its environment⁸— and Vernadsky's definition of life as a disperse of rock⁹ (which I paraphrased as "life is rock rearranging itself"), I quickly recognized that the Earth itself qualifies as a living entity. Its crust continually creates itself from erupting deep magma and recycles itself back into that magma at the edges of tectonic plates; its pervasive biological creatures are continually formed from and recycled into that same crust—all this in relation to Earth's Sun star, moon, other planets and greater galaxy.

Further, oceans, atmosphere, climate and weather are all global systems. While biological creatures from bacteria to mammoths and redwoods are created from the same DNA, the same minerals and largely from the same proteins. Therefore, evolution is better understood as the biogeological process of Earth as a whole and the changing species patterns, both physiologically and behaviorally, over time within that larger context.

This leads me to include in my view of evolution the observations:

- a) that the process of biological evolution goes well when individual, species, ecosystemic and planetary interests are met simultaneously and reasonably harmoniously at every such level of organization, and
- b) that human behavior is as much a part of biological evolution as is the behavior of other species.

Nested levels of biological organization were called holons in holarchy by Arthur Koestler¹⁰ and are a useful contrast to the hierarchies humans have tended to model in machinery and build into socio-cultural organizations. In a healthy holarchy, no level is more important or powerful than any other; rather, all are vitally important, so none can dictate its interests at the expense of interests at other levels. All levels must continually negotiate their interests with other levels. In our bodies, for example, cells must negotiate their interests with their organs, organ systems and the body as a whole, just as families (the next level of holarchy beyond individuals) must negotiate family interests with family members. A clear violation of healthy holarchy occurs when cancerous cells cease to negotiate and consider only their interests in proliferation at the expense of the body as a whole. This is, of course, a self-defeating strategy on their part.

The process of evolution is universally recognized as leading from the simple to the complex. Early Earth was a homogenized mass of mineral elements and evolved to the extremely complex planet of which we are part. Its first organisms were invisibly tiny archebacteria, while we ourselves are vastly more complex multicelled creatures. Multicelled creatures are relatively huge cooperative enterprises that could never have evolved if individual cells had been doomed to a struggle in scarcity, so they cannot really come about at all by the Darwinian hypothesis. Even the single nucleated cell—the only kind of cell other than bacteria—is now known to be a cooperative en-



terprise evolved by once hostile bacteria.

Note that I said, "once hostile." It seems that the first half of Earth's life in which bacteria had the planet to themselves, was for much of its existence indeed a Darwinian world of stiff competition, great crises caused by the archebacteria themselves and wonderful technologies they invented in the course of it, not at all unlike the human world's current situation. In fact, the archebacteria harnessed solar energy, invented electric motors (now coveted by nanotechnologists) and nuclear piles. They even invented the first WorldWide Web in devising their very productive and universal information exchange in the form of DNA trade, as I have described in great detail in my book *EarthDance: Living Systems in Evolution*¹¹. Eventually, however, as we know through the work of microbiologist Lynn Margulis¹², they created the collaborative nucleated cell, turning these very technologies to good use in cooperative ways and streamlining themselves, as well as committing to community, by donating some of their DNA to the collective gene pool we call the nucleus.

What (r)evolutionary learning process made this shift from competition to cooperation possible? The key to answering this question and developing a complete model of biological evolution is suggested by the standard classification of natural ecosystems into successive Type I, II and IIIs. A typical description of succession—defined as the replacement of species with other species—is as follows:

*Ecosystems tend to change with time until a stable system is formed... pioneer organisms modify their environment, ultimately creating conditions... under which more advanced organisms can live. Over time, the succession occurs in a series of stages which leads to a stable final community... called a climax community. This community may reach a point of stability that can last for hundreds or thousands of years.*¹³

Type I ecosystems are populated by aggressive species establishing their niches through intense, sometimes hostile, competition for resources and rapid population growth, while the species in Type III ecosystems tend toward complex cooperative or collaborative systems in which species feed or otherwise support each other to mutual benefit. Type IIs generally lump together various "transitional" ecosystems. It seems reasonable to ask where the "more advanced" species that can "build stable final community" come from? How did they evolve? Logically, there must have been a time when only pioneer species existed, yet somehow evolution led to the existence of mature, cooperative species. It would seem there had to be some kind of evolutionary learning process in which species discovered through their experience that cooperation pays!

Why not recognize the evidence for this ancient learning process revealed in the different types of ecosystems? We are certainly familiar with learning and maturation processes in human life, especially the transition from immature adolescence, so often feisty in its competitive stance, and socially cooperative maturity in adults, who at their best become wise elders role-modeling the finest in human behavior. The ancient adage "As above, so below" has proven itself again and again in seeing the similarity of patterns at different

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levels of Nature from simple to complex, from microcosm to macrocosm. It is in the similarity of its patterns that we see the true elegance of Nature. We know the stages of evolution in the archebacteria, from intense competition to their huge leaps in cooperation forming nucleated cells. We also know these cells' collaborative process in evolving multicelled creatures, all the way to our own highly-evolved bodies containing up to a hundred trillion cells, each of which is more complex than a large human city, each containing some 30,000 recycling centers just to keep the proteins of which they are built healthy.

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Again and again, our close looks at Nature show this sequence from intense competition to the discovery that peacefully trading with competitors, sharing with them, feeding them, providing homes for them, even helping them reproduce, all the while collectively recycling resources and ever enriching the shared environment, is the most efficient and effective way to survival and even thrival for all.

It is in this mature cooperation that we find the ethics Darwin thought could only be evolved by humans. Indigenous tribal peoples learned such ethics by recognizing them in Nature, copying reciprocal gifting and insuring food and shelter to all tribal members, even working consciously to ensure tribal and ecosystemic wellbeing seven generations hence. Like most indigenous peoples, ancient Greeks advised cooperating with Nature by giving back as much as we take from it, yet our advanced civilization seems to be the last to learn this. We seem stuck where Darwin was stuck, believing we are doomed to remain in hostile competition forever. How fond we are of repeating "You can't change human nature" without ever really looking clearly at the nature of Nature itself.

Glocalization as an Evolutionary Leap

For some eight to ten thousand years up to the present, much of civilized humanity has been in an empire building mode that is immature from the biological evolution perspective. From ancient empires ruled by monarchs we progressed to national expansion into colonial empires and more recently into multi-national corporate empires.

All these phases have increased our technological prowess while also increasing the disparity between rich and poor that is now devastating the living system comprised of all humans as well as the ecosystems on which we depend for our own lives.

As we have seen, healthy, mature living systems are dynamically cooperative because every part or member at every level of organization is empowered to negotiate its self-interest within the whole. There is equitable sharing of resources to insure health at all levels, and the system is aware that any exploitation of some parts by others endangers the whole. Clearly, internal greed and warfare are inimical to the health of mature living systems, and humanity is now forced to see itself as the single, global living system it has become, for all its problematic, yet healthy, diversity. Therefore, I see the formation of global human community—including, but not limited to, economics—as our natural evolutionary mandate at this time. We are actually achieving quite a few aspects of this process in positive, cooperative

ways; for example, in our global telephone, fax, postal and internet communications, in air travel and traffic control, in money exchange systems, in the World Court initiative and international treaties on environment and other issues, in most United Nations ventures, through ever more numerous and complex collaborative ventures in the arts, sciences, education, and sports, among religions and the activities of thousands of international NGOs. Yet the most central and important aspect of glocalization, the glocal economy, is still following a path that threatens the demise of our whole civilization.

Let me draw once again on the historical context of the alliance between science and industry. Hazel Henderson points out that Adam Smith related his famous theory of "an invisible hand that guided the self-interested decisions of business men to serve the public good and economic growth", as set forth in his 1776 book, *An Inquiry Into the Nature and Causes of the Wealth of Nations*, to Newton's great discovery of the physical laws of motion. Also, that economists of the early industrial revolution based their theories not only on Adam Smith's work, but also on Charles Darwin's,

...seizing on Darwin's research on the survival of the fittest and the role of competition among species as additional foundations for their classical economics of "laissez faire"—the idea that human societies could advance wealth and progress by simply allowing the invisible hand of the market to work its magic...this led economists and upper-class elites to espouse theories known as "social Darwinism:" the belief that inequities in the distribution of land, wealth and income would nevertheless trickle down to benefit the less fortunate. Echoes of these theories are still... propounded in mainstream economic textbooks as theories of "efficient markets", rational human behavior as "competitive maximizing of individual self-interest", "natural" rates of unemployment and the ubiquitous "Washington Consensus" formula for economic growth (free trade, open markets, privatization, deregulation, floating currencies and export-led policies).¹⁴

All these theories, as Henderson points out, underpin today's economic and technological globalization and the rules of the World Trade Organization, the International Monetary Fund, the World Bank, stock markets, currency exchanges and most central banks.

When the Bank of Sweden's economics prize, incorrectly but widely considered as one of the Nobel prizes, was awarded in December 2004 to economists Edward C. Prescott and Finn E. Kydland for their 1977 paper purporting to prove by use of a mathematical model that central banks should be freed from the control of politicians, even those elected in democracies, there was a wave of long-building protest. Scientists, including members of the Nobel Committee and Peter Nobel himself, demanded that the Bank of Sweden's economics prize either be properly labeled and de-linked from the other Nobel prizes or abolished on the grounds that economics is not a science, but a set of increasingly destructive policies¹⁵.

It seems high time for our dominant Western culture, especially the United States, to learn the economic lessons that were learned by many another species in the course of their biological evolution. In human economic terms, Henderson long ago made the analysis of the relative costs of destructive

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wars and constructive development,¹⁶ showing clearly how making war to destroy enemy economies was vastly more expensive than peaceful development of economies. More recently, Ben Cohen of Ben and Jerry's beloved ice cream company made an animated video for the web-based organization True Majority using stacked Oreo cookies to show the amount of money the US Pentagon requires for its military and the comparatively trivial amount it would take to feed all the world's children, build adequate schools and provide other basic services at home and abroad.¹⁷

The unsustainability of present economics has now become widely discussed around the world, but it is still not clear we understand deeply that the word unsustainable means "*can not last*," and therefore, "*must be changed*." Knowing how and why current economic policies are unsustainable is not enough; we must become more conscious participants in the process I call glocalization, rather than letting a handful of powerful interests and players lead us all to doom.

Capitalist free markets can only succeed in the long run if:

- a) they really are free, which is not currently the case, and
- b) if that freedom leads more and more towards friendly (rather than hostile) competition and increasing collaboration— not as exploitative cartels, but as ventures consistent with global family values.

Profits can be increased by treating people well and forming cooperative ventures such as BALLE (Business Alliance for Local Living Economies), a scheme I helped pioneer in the Social Venture Network (SVN) that is dedicated to building alliances among locally networked businesses for the common good.¹⁸

Reclaiming human communal values and acting upon them in ways that renew our economies while reversing the ravages of colonialism, and what John Perkins calls the "corporatocracy's" more recent predations as he so horrifically describes them in his new book, [*Confessions of an Economic Hit Man*](#),¹⁹ is absolutely necessary if we are to turn our economies from unsustainable paths of destruction to sustainable paths leading to thrival. Fortunately life is resilient, and we are witnessing a growing tide of reaction and dialogue on the present nature of economic globalization. These natural and healthy reactions have in common the recognition that communal values have been overridden in a dangerous process that sets vast profits for a tiny human minority above all other human interests. For a World Trade Organization to dictate economic behavior that does not meet the self-interests of small struggling nations, as it is increasingly discovering, would be like trying to run a body at the expense of its cells. We are living systems, whether we like it or not, and the only way to build a healthy world economy—to glocalize successfully—is Nature's way. (I use the terms glocalize and glocal economy to indicate all levels of economic holarchy from local to global.)

Economic success has so far been measured in monetary terms rather than in terms of well-being for all, focusing on GNP/GDP accounting rather than on quality of life accounting such as that pioneered by Henderson (See



footnote 14) and now taken up by many progressive economists and at least one nation—Bhutan—by decree of its king, while others, notably Brazil, are leaning in that direction.

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In my *EarthDance* book (See Footnote 11), as well as in my article "The Biology of Globalization"²⁰, I set out the Main Features and Principles of Living Systems, as

1. Self-creation (autopoiesis);
2. Complexity (diversity of parts);
3. Embeddedness in larger holons and dependence on them (holarchy);
4. Self-reflexivity (autognosis—self-knowledge);
5. Self-regulation/maintenance (autonomics);
6. Response ability—to internal and external stress or other change;
7. Input/output exchange of matter/energy/information with other holons;
8. Transformation of matter/energy/information;
9. Empowerment/employment of all component parts;
10. Communications among all parts;
11. Coordination of parts and functions;
12. Balance of Interests negotiated among parts, whole, and embedding holarchy;
13. Reciprocity of parts in mutual contribution and assistance;
14. Conservation of what works well;
15. Creative change of what does not work well.

This list was derived from my observations, as a biologist, of living systems from single cells to complex multicelled creatures, and of healthy ecosystems. These features should also be present in any healthy human system from family to community, business, government or other social system up to our global economy. But it became quickly clear that few businesses show these features. Note that numbers 9, 10, 12 and 13 on the list, in a business that functioned like a healthy living system, imply the active empowerment and participation of every employee of that business in what it does and how it is run, with open communications among all. This, in short, means full inclusion and transparency, features totally abused in recent cases brought to public light, such as Enron and WorldCom, which glaringly highlighted what happens to businesses that see themselves in fierce competition rather than as healthy, collaborative aspects of their greater (stakeholder) communities.

In sharp contrast, Bill George, former CEO of Medtronic and author of a book called *Authentic Leadership*, once made headlines by boldly declaring that shareholders came third, after customers and employees. In his address to the World Business Academy annual meeting in 2004 he expanded on this,

I set out the Main Features and Principles of Living Systems...few businesses show these features.



The Internet...shows all 15 features of a real living system.

saying, among other things, he had told all employees on becoming CEO that none of them would be fired on his watch. In a time of unprecedented job insecurity at all levels of employment up to the top, this was bold leadership toward a very healthy company, whose shareholders had no complaints on his watch either.

The Internet, which is playing a huge role in business by now, is a vast bootstrapping, self-organizing system that, however young and chaotic, shows all fifteen of the features in one way or another and must therefore be considered a real living system. One of the big problems remaining to be worked out on the Internet is its ethical self-governance. A *Wired Magazine* article on [Wikipedia](#), the phenomenal self-organizing web-based encyclopedia that rapidly outstripped—in numbers of articles—existing encyclopedias fashioned by experts over very long periods of time showed it to be an exciting example of how this self-governance is now coming into practice.

While anyone with web access is free to initiate, amend or extend articles at any time, fleets of dedicated contributors monitor the changes and quickly catch malicious insertions. As reported in the March 2005 issue, the average time it took to detect attempts to sabotage Wikipedia's integrity was 1.7 minutes!

Cooperation, collaboration and community empowerment are, as Nature role-models them and as I cannot repeat too often, more efficient and effective ways of doing business than living in fear of drowning in a competitive race or wasting energy and resources on beating down the competition.

Tachi Kiuchi, former CEO of Mitsubishi Electric, and Bill Shireman, an ecologist, put it this way in their important book, *What We Learned from the Rainforest*: "There is no problem ever faced by a business that has not been faced and solved by a rainforest."²¹ A rainforest is a Type III ecosystem in which mutual support among all species has proven more efficient and effective than spending energy to make war among species. (Note that predator/prey relationships are actually cooperative when seen from the ecosystem level of holarchy because prey feeds predators while predators keep prey species healthy.) The rainforest (like a prairie or coral reef) creates enormous new value continually by very complex production and trading systems as well as by recycling its resources very rapidly. Kiuchi has proposed a clear program for corporate accountability that he calls The Eightfold Path to Excellence²², posted on the website of this journal in which it was published. The eight steps of this path, related to the rainforest lessons, are:

1. Adopt a bold and visionary CORPORATE MISSION, one that envisions how your company will:
2. Conduct a regular ASSESSMENT of your success in maximizing return to stakeholders, and
3. Develop INCENTIVE STRUCTURES that reward the creation of real stakeholder value on behalf of the corporate mission.
4. Adopt MANAGEMENT SYSTEMS to help you manage the company toward maximum stakeholder return, and measure your step-by-step progress.



5. Establish a STAKEHOLDER ENGAGEMENT SYSTEM to monitor and solicit feedback from them.
6. Create value for the POOREST in the world, the stakeholders through whom the greatest mutual benefit can be delivered.
7. Issue an ANNUAL REPORT TO STAKEHOLDERS that is as systematic as your annual report to shareholders.
8. LIVE the mission of your business. Make THAT – not your 90-day earnings report – the map to guide your course.

From an evolution biology perspective, glocalization is a natural, inevitable, and desirable process, much broader than economics and already well on its way—the latest and greatest evolutionary instance of cooperative collaboration in a living system. Consider all the collaboration required for global communications from telephone and fax to television and the Internet, for money exchanges across all cultures, for international travel, scientific cooperation, world parliaments of religion, the many global activities of the United Nations, and so on. All these instances of cooperation remind me of the formation of the nucleated cell a few billion years ago, when the technologies invented by archebacteria in their hostile competitive phase were put to cooperative use in building the new communal cell. This glocalization process is not reversible, though it certainly could fail, with the consequent destruction of human civilization as we know it. The critical link will prove to be how we change the way in which we carry out our economic, business activity as a global species.

As we have seen, unopposed universal entropy and Darwinian evolution through struggle in scarcity, presented as official scientific Laws of Nature, have prevented us from seeing them as half-truths requiring completion from a more holistic perspective. The entropy of radiation balanced by gravitational 'centropy' is, at the biological level of Nature, the life/death recycling process that creates overall abundance—on Earth some 4.8 billion years of value creation despite huge accidental extinction setbacks. Darwin's struggle in scarcity is therefore not permanent for any species, because young pioneering species can and do learn to share, recycle, and support each other. We humans are such a young, pioneering species, and I believe we now stand on the brink of our own evolutionary maturity, ready to do business as it is done in the rainforest.

About the Author: Elisabet Sahtouris, Ph.D. is an evolution biologist, futurist, author, speaker and consultant on Living Systems Design. Showing the relevance of evolving biological systems to organizational design, she travels as a speaker in North, Central and South America, Europe, Asia, Africa, Australia and New Zealand. She makes television and radio appearances in addition to live speeches and workshops.

Dr. Sahtouris is a citizen of the United States and of Greece, with a Canadian Ph.D. She did her post-doctoral work at the American Museum of Natural History in New York, taught at the University of Massachusetts and M.I.T., was a science writer for the

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HORIZON/NOVA TV series. She was invited to China by the Chinese National Science Association, organized Earth Celebrations 2000 in Athens, Greece, and has been a United Nations consultant on indigenous peoples. She is a participant in the Humanity 3000 dialogues of the Foundation for the Future, the Synthesis Dialogues with the Dalai Lama in Dharamsala, and consults with corporations and government organizations in Australia, Brazil and the USA.

Dr. Sahtouris uses nature's principles and practice, revealed in biological evolution, as useful models for organizational change. She applies them in the corporate world, in global politics and economics, in our efforts to create sustainable health and well being for humanity within the larger living systems of Earth.

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