

# The Biology of Business

## New Laws of Nature Reveal a Better Way for Business



Elisabet Sahtouris, PhD ©2005

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### Introduction

As an evolution biologist, it is obvious to me that we humans are part of Nature and that Nature has been doing business for billions of years, if we take a broad definition of business to be the economy of making a living, of transforming resources into useful products that are exchanged, distributed, consumed and/or recycled. So, to talk about the biology of human businesses, I could simply point out that all our businesses are systems made up of people, who are living beings, and that therefore businesses are living systems or biological entities. QED. However, to say something more useful I need to go back through history to show why most human businesses, despite being made up of people, do not function like living systems, at least not like healthy living systems. Those few that do are swimming upstream against the norm, usually with great difficulty, and that just should not be, need not be and must not continue to be.

Our businesses, unlike those of other species, are organized and run in a socio-political cultural context, and that context has a history. Historical context has a great deal to do with what we believe about ourselves and our world, and when I sort through that socio-political history looking for the most salient influences on contemporary business from my own perspective, I am naturally drawn to the history of science.

Four very important publications by two great 19th century scientists have so strongly shaped our beliefs about our world that they affect everything about human culture including our definition of human nature and the way we do business. They are:

1850, Rudolph Clausius' *On the Motive Power of Heat, and on the Laws which can be Deduced from it for the Theory of Heat*

1859, Charles Darwin's *On the Origin of Species*

1865, Clausius' paper on Thermodynamics reformulating the fundamental laws of the Universe as energy constancy and entropy

1871, Darwin's *The Descent of Man*

I will argue that Clausius' model of a universe running down by entropy and the Darwinian model of biological evolution as an endless competitive struggle for scarce resources both give us half-truths about Nature that seemed appropriate in their historical context but are now seen to be fundamentally flawed, thereby seriously misleading

us and holding up our own natural evolution. The full truth—including the other half of a more holistic view in physics and biology respectively—reveals that Nature is on our side in role-modeling the evolutionary leap that would rapidly bring about an energy efficient and globally beneficial human economy that functions like a truly healthy living system.

The bottom line of human experience is that it all takes place within our consciousness and that our minds form the beliefs on which we act by collectively creating a uniquely human world. Change those beliefs and that world changes accordingly.

How could science have *failed* to rectify hugely important flaws in 19th century science even in the 21st century? I believe the answers lie in the fact that science, for all its protestations about being value-free, has never been an independent cultural endeavor free to pursue unbiased inquiry into Nature. Science was raised to the status of a secular priesthood—in the sense of being given the mandate and power to tell us how things are in our universe and who we are within it—by an even more powerful political economy, in turn for the great power of science in its engineering applications that keep that political economy in power.

Our world is now in sufficient crisis that transparency in all our endeavors is critical to our survival. Light shed on the relationship between science and political economy can, I believe, show us the way to true freedom and a healthy economy for all the world's people. It is Business that will lead the way, providing it, too, adopts transparency and belief in the mission of creating value for all stakeholders from people to planet.

### Science and Political Economy: in which God Gives Way to Man

Only a few centuries ago in Europe, a new alliance of industrial entrepreneurs and scientists forged the industrial revolution, bringing the modern age successfully into being and replacing the prior cultural hegemony of the alliance between Church and State. Let me address a few details of this process, while noting here the current attempt to reinstate the Church/State alliance in the U.S. at present.

Over the past few centuries, science became far more than a vast research enterprise that gave us an advanced

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technological society with more commercial products than any previous culture could possibly have imagined, along with “progress” at a breakneck pace that leaves us breathless and wondering if we can even hope to catch up with our own children and grandchildren. Science, in addition to spawning that technological society, also became the cultural priesthood appointed to give us our cultural worldview: our beliefs about How Things Are in this great universe of ours, and on our planet Earth in particular. This is a relatively new and very important historical phenomenon in the history of civilization, as the priesthoods of most previous civilizations (large organized sociopolitical entities with urban centers) with notable exceptions such as China, were religious, getting their worldviews more from revelation than from research.

The scientific worldview founded by Galileo, Descartes, Newton, Bacon and others was of a non-living, non-intelligent mechanical universe — a clockworks projected from human mechanical inventions to God’s as the “Grand Engineer’s” Design of Nature in which humans were just complex robots, the males alone imbued with a piece of God-mind, according to Descartes, so that they, too, could invent machinery. As models of celestial mechanics, the Newtonian motion of stars and planets, became more elaborate, social institutions as well were increasingly seen and modeled on mechanism and expected to run like the well-oiled machines of factories. Time/motion efficiency studies of workers turned people themselves into machines as Charlie Chaplin movies so well caricatured. Most of today’s businesses are still conceived, organized and run as hierarchical mechanics.

As men of science had come to feel increasingly competent and knowledgeable about the physical world, and in consequence felt themselves to be in control of human destiny, they had formally abandoned the “hypothesis” of God, thereby removing any notion of Nature, including humans, as existing through sacred creation. Rather, Nature was redefined as a wealth of natural resources to be exploited by Man, the pinnacle of accidental, natural evolution.

One of the most pervasive and persistent cultural beliefs we have been given by science is the concept of this godless universe as non-living, accidental, purposeless and running down by entropy, with life defined as a transient “negentropy” opposing this force of decay, yet never overcoming or even balancing its inevitable slide into heat death. To me, this is like describing the life of any one of us as a one-way process of decay toward death, with a negdecay process of birth and growth opposing it, though overall unsuccessfully.

This dreary view of life made me wonder deeply about the very concept of non-life, realizing in the process that it was invented by western science. All cultures have understood life and death, but non-life is something that never was or will be alive — a concept that came into human culture with the invention of mechanism in ancient Greece and resurfaced some dozen centuries later in a new era of mechanics. Was it really appropriate, I asked myself, for science to force life to be defined within a context of non-life? Could one really explain the existence of living things as accidentally derived from non-living matter? Could one derive intelligence from non-intelligence, consciousness from non-consciousness as I was consistently taught in the graduate science departments of several universities and research institutions?

### Entropy reconsidered

It was German theoretical physicist Rudolph Clausius, who first formulated the two basic laws of Nature in 1865 — exactly halfway between Darwin’s publication of *The Origin of Species* in 1859 and *The Descent of Man* in 1871 — as:

1. *The energy of the universe is constant.*
2. *The entropy of the universe tends to a maximum.*<sup>1</sup>

Clausius’ work on the thermodynamics of entropy, openly acknowledged by Maxwell in England, was based on Sadi Carnot’s experimental work with energy transfer in the closed mechanical systems of steam engines and applied (by Clausius) to the universe as a whole with no evidence that the universe was a closed system in which such extrapolation might be valid. Yet these two “inviolable laws”, along with the more basic conceptualization of the universe as purposeless non-life, have persisted since as absolute dogma in physics and all other areas of science.

But this model is a less satisfying conceptualization from scientific observation than the ancient Taoist, Vedic and Kotodama model of a universe built on fundamental dualities within the Oneness of Cosmic Consciousness, which Yasuhiko Genku Kimura has explicated from a number of perspectives in the pages of this journal. Dualities are essential to the process of creation and the primary duality is often described as outward/inward, centripetal/centrifugal, expansion/contraction, translating in contemporary western science to radiation/gravity as the most fundamental forces or features of Nature.

Elsewhere, I have cited Walter Russell<sup>2</sup>, as well as Nassim Hameiri and Elizabeth Rauscher<sup>3</sup>, for their models of a universe in which entropic radiation and centropic gravity are in a perfect dynamic balance of expansion and

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contraction that constitutes a unified field. Hamein and Rauscher's theory is so conceptually and mathematically elegant that universal forces are reduced from four to two and the need to postulate hypothetical dark matter and energy in the universe is eliminated. In short, the work has been done to show that a universe of unified opposites satisfies our observations better than a one-way entropic universe, and shows that the universe is *not* running down at all.

The still "official" entropic universe, conceptualized after Einstein as beginning with a Big Bang and deteriorating ever since, is in sharp contrast to previous worldviews of Nature as alive and vibrant with intelligent creation and purposive direction—a view closer to my own model of a self-organizing, living universe in which planetary life is a special case of extra complexity, now actually measurable as being halfway between the microcosm and the macrocosm, where "upwardly" and "downwardly" spiraling energies collide on physical surfaces where such life can evolve<sup>4</sup>.

Historically, the social consequences of the proclamation of an entropic universe by the scientific establishment were enormous, giving rise, for example, to belief in the Malthusian struggle for existence in a world soon to end (see below), interpretations of Darwinian evolution theory as a "dog eat dog" world and a philosophy of Existentialism extending this view of the purposeless and hopeless human struggle into psychology, art and western culture at large. Such beliefs fostered the growth of our current consumer society with its "get what you can while you can" outlook in which advancing in the "job market" to increase power to consume became the driving force of modern and post-modern western civilization. Humanitarian social values and morals were left to religions with lesser persuasive clout than science, which came to openly pride itself on being value-free, and therefore even more *scientific* (read: unassailable in its conclusions about How Things Are.) Small wonder that businesses carried out the competitive struggle justified as "social Darwinism" and deemed inescapable

### Darwin, Global Conquest and Evolution

Darwin himself had concluded with great elaboration in his magnificent opus on *The Descent of Man*, that humans must exercise their evolved capacity for moral behavior, as David Loye has so beautifully pointed out in his book *The Great Adventure*<sup>5</sup>, but this aspect of Darwin's work was not promoted by the science that took up his theory of evolution, focusing rather on his explanation of strug-

gle in scarcity as the driver of evolution, which is best understood as rooted more in Darwin's historical context than in Nature itself. Had Darwin been able to see beyond that context, he might have noticed that highly evolved natural systems evolved long before humans display cooperation, mutual support, altruism and other features we define as ethical, but that is getting ahead of my story.

Columbus' voyages in the late 15th and early 16th centuries had inspired commerce between Europe and the New World, including such feats as Pizarro's plunder of 24 tons of treasure collected for the Andean Inca Atahualpa's ransom before his murder—exquisite art works of master craftsmen that were melted into gold bricks for transport to Europe—and trade in African slaves that were used to build colonial infrastructure, care for the colonists, etc. The American colonies were, in fact, settled by a corporation—the Massachusetts Bay Company, chartered by King Charles in 1628 for the purpose of colonizing the New World and its commercial ventures.<sup>6</sup>

Magellan's global voyage in the 16th century had established that all the world's territories were finite and could be owned, and the East India Company had been founded in 1600, Queen Elizabeth granting it monopoly rights to bring goods from India to challenge the Dutch-Portuguese monopoly of the spice trade. Eventually the East India Companies of eight European nations functioned as the world's first great multi-national corporation or multi-national cartel of corporations. Though it incited American colonists to riot in the Boston Tea Party rebellion of 1774, Betsy Ross was commissioned in 1776 to sew the circle of stars representing the first 13 states of the new union over the British emblem in the top corner of an East India Company flag to create the first US flag. To this day we retain its thirteen red and white stripes with a blue corner field.

In Darwin's day, Thomas Malthus had been commissioned to inventory the Earth's natural resources as head of the Economics Dept. of the East India Company's Haileybury College. Malthus concluded from his work that the world would end soon because human populations would overwhelm food production, causing an inevitable dying off of humans. This prediction justified the East India Company's "us or them" policy of assaying and acquiring all the Earth resources possible for Europeans so that they, at least, could survive.

It was Malthus who hired Darwin to continue his Earth inventory work for the East India Company and, when at a loss to otherwise explain the driver of evolution for his theory, Darwin simply adopted Malthus' theory of

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competition in scarcity, thus giving us our social vision of scarcity and fierce competition for resources, of humanity doomed permanently to win/lose economics and warfare. As Darwin put it in *The Origin of Species*:

*... Nothing is easier than to admit the truth of the universal struggle for life, or more difficult...than constantly to bear this conclusion in mind. Yet unless it be thoroughly engrained in the mind, I am convinced that the whole economy of nature, with every fact on distribution, rarity, abundance, extinction, and variation, will be dimly seen or quite misunderstood ... As more individuals are produced than can possibly survive, there must in every case be a struggle for existence... It is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms; for in this case there can be no artificial increase of food, and no prudential restraint from marriage.<sup>7</sup>*

Thus, Darwinian theory as Darwin himself established it, not just through later misuse as “social Darwinism”, was very essentially rooted in political economy, which was itself rooted in a scientific worldview of a godless, mindless, coldly mechanical universe ever running down.

### 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 environment<sup>8</sup> – and Vernadsky’s definition of life as a disperse of rock<sup>2</sup> (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 Koestler<sup>10</sup>, 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 enterprise evolved by once hostile bacteria.

Note that I said, “once hostile”. Indeed 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

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in my book *EarthDance: Living Systems in Evolution*<sup>11</sup>. Eventually, however, as we know through the work of microbiologist Lynn Margulis<sup>12</sup>, 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.*<sup>13</sup>

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 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 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.

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 thrive 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.

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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).<sup>14</sup>*

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 exchange 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 policies<sup>15</sup>.

It seems high time for our dominant western culture, especially the United States, to learn the economic lessons that were learned by many an other species in the course of their biological evolution. In human economic terms, Henderson long ago made the analysis of the relative costs of destructive wars and constructive development,<sup>16</sup> 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.<sup>17</sup>

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.

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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<sup>18</sup>.

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*,<sup>19</sup> 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<sup>14</sup> 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<sup>11</sup>, as well as in my article “The Biology of Globalization”<sup>20</sup>, 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, implies 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, 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.

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The Internet, which is playing a huge role in business by now, is a vast boot-strapping, 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".<sup>21</sup> 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 Excellence<sup>22</sup>, 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
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. ☞

# The Biology of Business

## New Laws of Nature Reveal a Better Way for Business



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