RESTORATION

Although we carry the ocean within ourselves, in our blood and in our eyes, so that we essentially see through seawater, we appear blind to its fate. Many scientists speak only to each other and studiously avoid educating the press. The media seems unwilling to report environmental news, and caters to a public stalled by sloth, fear, or greed and generally confused by science. Overall, we seem unable to recognize that the proofs so many politicians demand already exist in the form of hindsight. Written into the long history of our planet, in one form or another, is the record of what is coming our way.

—Julia Whitty, "The Fate of the Oceans"

What is abundantly clear is that all *life—from bacterium to elephant—shares common characteristics at the level of molecules. There is a common thread that runs through the whole of biological existence. . . . These molecules run through life in the same way as the musical theme runs through the last movement of Brahms's Fourth Symphony. There is a set of variations which superficially sound very different but which are underpinned by a deeper similarity that binds the whole. The beauty of the structure depends upon the individuality of the passing music, and also upon the coherence of the construction. That vital spark from inanimate matter to animate life happened once and only once, and all living existence depends on that moment. We are one tribe with bacteria that live in hot springs, parasitic barnacles, vampire bats and cauliflowers. We all share a common ancestor.*

—Richard Fortey,
Life: A Natural History of the First Four Billion Years of Life on Earth

Every cell's dream is to become two cells. —François Jacob

One quadrillion cells make up a human being, and 90 percent of them are bacteria, fungi, yeasts, and other microbes, without which we could not survive. Therein lies a paradox: what makes us fully human is, well, not human. The prospect that we descended from lower primates, anathema to Christian fundamentalists, is a relatively minor phenomenon in the larger picture of science. Within our body is the backstory of the earth four billion years ago, the molecular chains, elemental compounds, simple bacteria, and salty fluids that wash our eyes and surround our cells, forming a compendium of life that has preceded us. We have always been a work in progress, a cumulative animal, a chimeric fusion of different organisms from the beginning of life "bound together by the elastic string of time."[4] It is thought that our microbial ancestors came into being when a soupçon of carbon polymers, nucleotides, and amino acids combined over a sulfurous oceanic vent. It was a preternatural event, if ever there was one: a living cell made of inanimate compounds. In truth, we do not know precisely how life started, and as one biologist noted, only fools and knaves would venture such a claim. The leap from chemical soup to microbe seems astounding, as if Gutenberg's first printing press were a laser printer attached to a laptop—and not just any laptop, but one that could generate new laptops endlessly from simple compounds. No doubt, preceding the creation of the first cell were tens of millions of years of chemical experiments where precursor forms of life existed in different combinations. Yet until recently it was thought that the odds of life arising in such a dilute broth were so remote that no statistical analysis could approximate the eventuality—one analogy suggested a hurricane assembling a Boeing 747 after sweeping over a wrecking yard full of parts.[5] Science, which once bought into the junkyard odds, has flipped the logic: we now regard the miracle of life not as its impossibility but as its inevitability.[6] Given conditions similar to those that existed on earth when life began, life would emerge again and again.

That first form of life was a microscopic single-celled organism called a

prokaryote, which roughly translates as "pre-kernels," cells without true nuclei. They are graphically depicted in textbooks as capsules with wiggly material inside, which is a gross simplification. A single bacterium cell, *Escherichia coli,* contains 2.4 million protein molecules of nearly 4,000 different types, 280 million small metabolite and ion molecules, 22 million lipids, a genome consisting of 4.6 million base pairs of nucleotides, and 40 billion water molecules, all packed into a cell whose diameter is one-hundredth the width of a strand of hair.[7] Those first cells, in Robinson Jeffers's words, "had echoes of the future" in them[8] and essentially took over the planet. They are in every ditch, on every leaf, in the sky, at the South Pole, on our tongues, three miles deep in the ocean, and throughout the deserts of the world. They created photosynthesis, respiration, and fermentation, and eventually mitochondria and chloroplasts, the organelles that digest, breathe, and circulate nutrients in our cells. Although we have identified the molecules in a single *E. coli* cell, we do not understand how they work together to create shape, reproduction, mentation, and purposeful behavior. When we take apart a cell, life disappears, because molecules are *all* we find.

Prokaryotes pioneered the different pathways through which life can metabolize energy, from sunshine to sulfur, and then started a grassroots movement, combining into compartmentalized colonies to create a new form of life, eukaryotes, cells with nuclei that could assemble themselves into skinks, honeysuckle, and humans. Eukaryotes took the molecular palette devised by prokaryotes and became artists, assembling into millions of different life forms, creating praying mantises, chanterelles, night-blooming jasmine, and limbic systems, a great stew of life spiced with shyness, coffee beans, caribou herds, and Mahler's Second Symphony. The difference between a prokaryote and a eukaryotic cell is like an igloo compared to the city of Paris. With 30,000 genes and 400 billion molecules, a single animal cell exceeds any Intel microprocessor in its prodigious computational breadth. Each cell simultaneously conducts millions of molecular processes involving trillions of atoms. Multiply that activity by the trillions of cells in the quintillions of creatures on the planet, and it raises a fair question: Who, exactly, is in charge? The total amount of intra- and intercellular activity in just one human body is staggering: one septillion actions at any one moment—a one with twenty-four zeroes after it. In one second, our body has undergone ten times more processes than there are stars in the universe, exactly what Charles Darwin foretold when he said that science would discover that each

living creature was a "little universe, formed of a host of self-propagating organisms, inconceivably minute and as numerous as the stars in heaven."[9]

Complex, multitrillion-celled replicating organisms called *Homo sapiens* can argue with one another about the environment and how serious climate change is. But we cannot sit down with a cell and discuss our personal aspirations or the flaws of free-market capitalism. Life is life, and nothing politicians have said or voted for can influence primary biological principles. As author Bill McKibben wryly noted, given a choice between the laws of Congress and the laws of physics, he was pretty sure the laws of physics would prevail. It is an understandable vanity for humans to believe that their cells are privileged or unique, but the distinction between human cells and those of a sunflower is shockingly narrow, while between primates and humans, the difference is slender as a thread. To distinguish between human cells and those of newts, seals, or coyotes, one has to descend to the molecular level of the cell to find the odd dissimilarity. We *are* nature, a realization that stopped Emerson dead in his tracks in Paris, and may it stop us in ours. We live in community, not alone, and any sense of separateness that we harbor is illusion. Humans are animals, albeit extraordinary ones, and have no special immunity conferred upon them. Given the present rate of planetary pollution and destruction, we need to negotiate a détente with nature and ourselves.

The collective functions of the septillion concurrent activities in our body have a name: resilience. This extraordinary redundancy is why we can be callous about our physical needs, bolting fast food, poisoning ourselves with alcohol and drugs, living in polluted air, and still surviving. Likewise, we can insult nature in myriad ways and still have cornflakes, an SUV, and a functioning planet each morning. Resilience is one of the secrets of life, and functions as the opposite of the domino theory. Cells mutate and fail constantly, but do not take down the cells around them. Healthy organisms and ecosystems are diverse, unpredictable, redundant, and adaptive. Life is astonishingly connected, but it refuses to march in lockstep or synchronize its watches. Any living system is a dialectic of harmony and autonomy, persistence and flux, predictability and instability. We don't have one brain but three—reptilian, limbic, and neocortical—and each has different functions and capabilities. A human can lose his eyesight, limbs, a frontal lobe, a kidney, and half his lung capacity, and still survive. By definition, evolution produces creatures and systems that have the greatest ability to persist

over time, and resilience allows an organism to withstand the greatest range of disturbances. This is as true for social systems as it is for environmental ones, for governments and corporations as it is for fisheries and reefs. The more resilient a system, the more shocks and impacts it can withstand and still recover.[10] Conversely, as systems lose diversity and thus functional redundancy, they become vulnerable to disruption or collapse.

Ecology is about how living organisms interact with one another and their environment. Sustainability is about stabilizing the currently disruptive relationship between earth's two most complex systems—human culture and the living world. The interrelation between these two systems marks every person's existence and is responsible for the rise and fall of every civilization. Although the concept of sustainability is relatively new, every culture has confronted this relationship, for better or ill. For thousands of years civilizations have not been able to reverse their tracks with respect to environmental damage but rather have declined and disappeared because they forfeited their own habitat. Today, for the first time in history, an entire civilization—its people, companies, and governments—is trying to arrest the downspin and understand how to live on earth, an effort that represents a watershed in human existence. Life is either increasing or decreasing; there is no Goldilocks happy medium where everything is just right. At this point in our environmental freefall, we need to preserve what remains and dedicate oursleves to restoring what we have lost.

Some would argue that the task is futile. Robert Kaplan's grim auguries of a world where crime, violence, and anarchy are fed by environmental scarcity and inequities seem uncomfortably present. Jared Diamond's *Collapse* chronicles the ways human beings have repeatedly ignored environmental feedback and spiraled into oblivion. Despite the popularity of such books, the general public is, at best, only dimly aware of the extent to which problems are rapidly multiplying. Nevertheless, the world is fast reaching a we're-not-in-Kansas-anymore moment whether it realizes it or not. Although the scale of environmental and social breakdown is so vast it isn't possible for any one individual or institution to be fully informed about it, the warning signs are omnipresent.

Recently two largely unnoticed events occuring within a span of twelve months marked our future on earth. On March 30, 2005, the *Millennium Ecosystem Assessment* report was released by organizations representing 1,360 scientists in 95 countries. The $24 million *Assessment* was the largest such scientific study ever undertaken of the planet's carrying capacity. It was the

first time global civilization surveyed the world's biological resources and assessed how the increasing losses would affect our future. Although detailed in its analysis, the final diagnosis was straightforward: the earth is wearing out and will soon become exhausted, incapable of supporting life as we know it. The report included little data that hadn't been said, published, or ignored before. The novelty of the study was its breadth and the deliberateness of tone. It acknowledged what scientists have been alarmed about for more than a decade: ecosystems, like all nonlinear systems, do not necessarily wind down gradually when under assault but may reach triggering thresholds, ecological heart attacks, where they suddenly collapse and die. Resilience can only protect a system to a point before failure can take down the whole.[11] What the scientists couldn't say, journalists around the world could and did: We are on the brink of disaster.[12]

What that report did not address was climate change, a parallel brink. In the past year prognostications about the timing and effects of climate change have become even more dire. The transformation of the earth's climate has typically been portrayed as a gradual warming that will cause a series of adverse effects: rising sea levels, loss of some species, the movement of tropical disease into temperate zones, more droughts, more intense rainfall and floods, more powerful hurricanes, and shifts in agricultural productivity. In other words, tough stuff, but something we can adapt to and live with. New science, however, suggests that current climate models greatly understate the rate and magnitude of change.[13] We may have already broken the thermostat, and if we do not get it repaired, all other ameliorative activities will dim in relevance. The greatest warming today is occurring at the poles, not the equator, and rising temperatures there are releasing another gas, methane, from permafrost, where it has been locked up for millions of years. Methane is twenty-four times more powerful than carbon dioxide as a greenhouse gas. A rapid rise in its release into the atmosphere would create a dramatic increase in warming, a positive feedback loop that would accelerate additional methane release. If such a runaway event were to take place, it could occur within forty years or less, and would transform the planet into a biological desert. Once that is precipitated, no change in our energy use could affect the outcome. As the long-term predictions became more dire, the daily weather becomes more biblical, which perhaps explains why 2006 was the year that many die-hard skeptics dropped their objections and urged action on climate. *The Economist*, which a year earlier was praising Michael Crichton's book comparing climate scientists to Nazi

eugenics professors, reversed its course in a special issue addressing climate change.[14] Rupert Murdoch's right-wing London tabloid *The Sun*, which had heretofore ridiculed environmentalist and climate issues, printed ten things readers could do to reduce their energy use. And as previously noted, it was the year Christian evangelical leaders called for rapid and massive efforts to address climate change. In short, the movement to restore the earth heated up.

How could something so important as this movement grow so much and be largely unseen? Describing the breadth of the movement is like trying to hold the ocean in your hand. It is that large. When an iceberg rises above the waterline, the massive ice beneath is unseen. When Wangari Maathai won the Nobel Peace Prize, the wire service stories didn't mention the network of six thousand different women's groups in Africa that were planting trees. When we hear about a chemical spill in a river, it is never reported that more than four thousand organizations in North America have adopted a river, creek, or stream. We read that organic agriculture is the fastest-growing sector of farming in America, Japan, Mexico, and Europe, but no connection is made to the more than three thousand organizations that educate farmers, customers, and legislators about sustainable and biological agriculture.

The distinctive bent of the movement is to tackle problems directly. We live in a faith-based economy, and by that I do not refer to religious practice. People are asked to place their faith in economic and political systems that have polluted water, air, and sea; that have despoiled communities, sacked workforces, reduced incomes for most people in the world for the past three decades, and created a stratosphere sufficiently permeated with industrial gases that we are, in effect, playing dice with the planet. One does not have to demonize the corporate system to recognize that it has no means to account for its negative impacts, except as a charitable footnote to its annual reports if it is inclined to donate a small part of its earnings. As that faith begins to seem more and more misplaced, the way to change the world is to change one's own practices, including one's home, source of energy, method of agriculture, diet, transport patterns, and communities. Not that Kyoto Protocols shouldn't be signed or adopted—symbols are ever important—but you can't get there from here by any mechanism that depends on support from institutions that benefit from the status quo. Efforts must continue to be directed to bring about institutional change, but such efforts cannot succeed unless people reexamine how they behave and consume in their own lives. The movement can be seen as weak when measured

against large institutions, but its goals are more important. The goal is to create a more resilient social and economic understory in what is basically an oligarchic world, a powerful act that restores a measure of autonomy and power to citizens.

To understand what the movement is, you need to ask what it does.[15] Molecular biologist Mahlon Hoagland wrote a primer entitled *The Way Life Works* that identifies sixteen qualities common to all living organisms, and most apply to social movements.[16] The first trait: *Life builds from the bottom up.* Just as complex organisms are built of cooperating communities of cells, the movement to address environmental and social issues has been built up by small, cooperating groups of people. Just as cell communities in the body attend to different functions, from taste buds to kidneys, groups organize around specific causes, missions, and objectives. Because the movement's growth rises from the grassroots, it can at first appear powerless; powerful people, after all, have the means to express themselves and satisfy their needs. For those who feel excluded by governments, corporations, or institutional processes, voluntary and nonprofit associations are the sanctioned and sometimes nonsanctioned way they can express their needs. Together these groups form a different body politic, and create different social building blocks. There is no better example of building from the bottom up than the thousands of organizations that focus on microfinance, providing loans to disenfranchised or poor people who do not qualify for loans from traditional financial institutions because they lack assets or have low income, or because of discrimination, such as that against women. The intention of microcredit institutions is to alleviate poverty by funding income-generating activities for self-employment wherever the poor live, from Apoyo Para el Campesino Indígena del Oriente in Bolivia to the Zimbabwe Association of Microfinance.

Just as *life assembles itself into chains,* nonprofits aggregate either by linking up interests, people, or communities, or by linking to related organizations. The building blocks of all life forms are polymers, long chains of smaller units called monomers. We have many names for polymers, depending on their composition: leather, starch, protein, DNA, cashmere, cellulose, egg whites, spider silk, cotton, toenails, rubber, crab shells, and enzymes. The basic function of the movement is linking, and there are many names for the constituent subsectors, depending on the units being joined. The social polymers are profuse and include women's rights, wetlands, wildlife corridors, water, waste reduction, wealth disparity reduction,

wind power, workers' rights, and women's health—and these, as you may have noticed, are just some of the areas that begin with the letter "w."

What works in nature persists, and it works because it evolved through unceasing invention and experimentation. *From a few themes, life generates many variations.* Those variations are generated endlessly and relentlessly. To continuously take advantage of new possibilities requires constant change and adaptation, which results in many diverse organizations. I have heard it said many times that the movement is inefficient, that there are too many groups and too much overlap. I have no doubt that is true, but I suspect the opposite is also true: namely, that citizen-based organisms are the most efficient social entities on earth, outstripping corporations and institutions manyfold in how effectively they deploy resources. Rather than being the lowest common denominator of social organization, they should be regarded as the fundamental unit of social change. Democracies aggregate votes into centralized bureaucratic institutions. The movement morphs social intention into agile, responsive organizations. They are more effective precisely because they make the most efficient use out of limited resources. I doubt there is a health organization in the world as beneficial *and* efficient as Paul Farmer's Partners in Health, a community-based nonprofit in Haiti's Central Plateau. Patients who live near the clinic that the Partners operate with their sister organization, Zanmi Lasante, get better attention and health care than people in the South Bronx or South Central Los Angeles. No money-center bank in New York or London has a loan portfolio as diverse, cost-effective, and helpful to its depositers and society as the Grameen Bank in Bangladesh, the pioneer in microlending. The Rainforest Action Network has done as much to instigate corporate reform (Citibank, Goldman Sachs, JP Morgan) than Eliot Spitzer did as attorney general of New York at a fraction of the cost. Very few of these organizations have sustained resources or savings; they live year to year, and it is difficult to waste money when you don't have it. Governments and corporations spend money to solve problems because they can. The NGO community has no such capability. It must find social niches within which to survive, make itself immediately useful, and constantly adapt to the needs of its stakeholders. Feedback loops are short, learning is accelerated.

Because the movement is not an ideology, there can be no concision of goals, no succinct slogans representative of the whole. It is a body of thought that coheres into a values system but not a belief system; it is a confluence of evolving ideas that never ceases; a creator of choice, actions, and

solutions that confront suffering and degradations visited upon people and the earth. Its atomization may prevent it from ever becoming coherent enough to challenge marauding institutions as large as the U.S. government or ExxonMobil; it could succeed on many of the smaller issues and still lose the day. In response to the charge that the movement represents a gloomy assessment of the state of the world, may it be said that every person working in the movement has a parallel goal: to prove all doomsayers wrong. It is not burdened with a syndrome of trying to *save* the world; it is trying to *remake* the world. Nonprofits find partners wherever they can, and address key issues by joining with other institutions, whether they are corporations, governments, universities, or religions. What distinguishes the movement from more venerable institutions is that it does not require an overriding structure, central authority, or dominance to function. Just as *life organizes with information,* the most powerful instrument wielded by the movement is an unimpeded flow of information, for that directionless communication is the only way the whole of humanity can reorganize itself.

Just as the human body cannot be explained or managed by conventional means, neither can humanity. Hoagland estimates it would require 1,500 encyclopedias to create an owner's manual for one person. The exquisite integration of movement, thought, physiology, sight, touch, and metabolism supersedes the complexity of any other system we can imagine. *Something* operates us, but what? Is it not the free flow of brilliant and ancient information, an involuntary and endemic intelligence freely exchanged on the cellular and intracellular level? This is the system in which we should place our faith, because it is the only one that has ever worked eternally. If this enlightening, enlivening pulse is God, then may we get on our knees and give thanks night and day. If it is Allah, may we face the east five times between sunup and sundown and humble ourselves. If it is Yahweh, may we touch the Holy Wall and shed tears of gratitude. If it is biology, may science touch the sacred. I believe it is all of these, but whatever it may be to each person, and however we name it, it is not knowable.

For similar reasons we may deduce that it is reasonable to conclude that we cannot embrace or manage the plethora of problems that confront us. The world simply appears to be out of control. Too often, however, such problems seem insoluble because of how they are managed—with ideological, top-down, oligarchic, militaristic management styles. If we tried to consciously control our bodies, we would die, just as the planet is dying. We don't manage our bodies because we cannot. We can, however, protect,

nurture, listen to, and tend to them with food, sleep, prayer, friendship, laughter, and exercise. And that is all the planet asks from us: allies, rest, nurturance, respect, celebration, collaboration, and engagement. Can a global system of citizen-based organizations with simple, clear values turn the world away from war, climatic chaos, social devolution, and environmental collapse? If history is a guide, the answer is no. In the past two centuries, we have seen the struggles for fundamental rights of freedom, democracy, and human dignity repeatedly overtaken by chronic and endemic poverty. On top of that ongoing effort, we now face another task, a campaign to surmount our legacy of environmental neglect. To succeed requires ubiquity, a network of informants, a conspiracy of social imaginaries, groups that cultivate new knowledge, share it, seek information elsewhere, and provide it to agencies and citizens who need it. Without question, each individual part of the movement is not up to the task, for it will inevitably be outgunned by larger institutional forces. But as each organization attends to its mission, it need not attempt to match the sheer firepower arrayed against it. These groups do not have to dominate the world with a new order; they need only take their rightful place in a multicentric planet in which no institution is dominant. Rather than having megasolutions, they need to solve for pattern.[17]

The term *solving for pattern* was coined by Wendell Berry, and refers to a solution that addresses multiple problems instead of one. Solving for pattern arises naturally when one perceives problems as symptoms of systemic failure, rather than as random errors requiring anodynes. For example, sustainable agriculture addresses a number of issues simultaneously: It reduces agricultural runoff, which is the main cause of eutrophication and dead zones in lakes, estuaries, and oceans; it reduces use of energy-intensive nitrogen-based fertilizers; it ameliorates climate change, because organic soil sequesters carbon, whereas industrial farming releases carbon dioxide to the atmosphere, and is the second-greatest cause of climate change after fossil fuel combustion; it improves worker health because of the absence of toxic pesticides; it enables soil to retain more moisture and is thus less reliant on irrigation and outside sources of water; it is more productive than conventional agriculture; it is less susceptible to erosion; and it provides habitat for pollinators, birds, and beneficial insects, which promotes biodiversity. On top of all that, the resulting food commands a premium in the market, making small farms economically more viable. Solving for pattern is the de facto approach of the movement because it is resource constrained. It cannot afford "fixes," only solutions.

Nature works in cycles, and so does a healthy society. A self-correcting system thrives because of feedback. The movement is composed of small organizations because it is on the ground, with its people at the scene—a scale at which information can be generated and acted upon. At this level, organizations quickly adapt. Mistakes are hidden treasures, Joycean "portals of discovery," because we learn from our failures. The opposite of learning is a runaway system where mistakes are relegated to file cabinets and ignored. When a government, corporation, financial institution, or religious organization insulates itself, its initiatives, however well intended, create uncontrolled outcomes and second-order effects that generate newer problems. The current state of the world reflects a problem-solving methodology never seen in nature: remedies from above imposed upon the excluded. The movement offers a solution-creating methodology from below that is inclusive, a process that mimics biological adaptation and evolution. Every physical activity the human body sustains is part of a cyclical, biological system with a self-correcting bias. The same should be true of every social activity, with a system called democracy.

Nature recycles not only information, *nature recycles everything;* nothing is wasted, nothing is thrown away because there is no "away." All natural processes are cyclical, and every scrap of matter, atom, and molecule is reused and repurposed into new flows of life. Industrial society behaves like a spoiled child casting away its unwanted toys in every direction, the only creature that leaves a wake that cannot be recycled by nature *or* industry. The movement doesn't merely advocate recycling, it actively imagines a system of human production that is as elegant, frugal, and abundant as what we observe in nature. One of the first people to have discussed human production in biological terms was economist Kenneth Boulding, a native of Liverpool who became a brilliant academician on two continents. In 1965 Boulding introduced the concept of "spaceship earth" in a lecture as a trope to help people understand that our prowess in development and subduing nature was changing our perception of a limitless earth into one that was a "tiny sphere, closed, limited, crowded, and hurtling through space to unknown destinations."[18]

In his book *Operating Manual for Spaceship Earth,* published four years after Boulding introduced the trope, Buckminster Fuller commented that spaceship earth had been so extraordinarily designed that human beings, who had been traveling on it for at least two million years, had yet to recognize they were on a spaceship. And indeed, how would one design a spaceship to support biological life for two million years, or four billion?

This is a question I have sometimes posed to corporate managers who could not see the practicality or necessity of transforming their business practices into ecological ones. One event at a large company that specialized in agricultural chemicals was particularly instructive, because it was precipitated by a vice president's sharp retort to a colleague's statement that there needed to be equitable distribution of resources as a prerequisite for moving toward a more sustainable world. His exact reply: "That is communism, socialism—it has nothing to do with ecology or the environment." Sixty of the company's chemical engineers were then divided into four teams, each with the same task: in two hours, design a spaceship that could leave earth and return in one hundred years with its crew alive, healthy, and happy. A biome was called for—an ecosystem that would provide food, clean water, medicinal plants, and fiber for a century. Each team also had to design the entire culture of this society—who would be on the ship, what they would do, the lines of authority, and all the messy details of creating and maintaining a society. The spaceship could be as big as necessary, and it could receive light from outside. But it had no escape hatches, and what happened on the spaceship stayed on the spaceship for a century.

All four proposals were sophisticated, but one stood out as the preferred ship for the long voyage out and back. The winning designers set up some unusual features. Instead of bringing caches of DVDs and display screens for onboard entertainment, they decided that a significant proportion of the passengers should be artists, musicians, actors, and storytellers. To endure for one century, the passengers needed to *create* a culture rather than simply consume one. They brought onboard a large variety of weeds, not just useful seeds, to enliven the soils and bring minerals to the surface. They brought mycorrhizae and other fungi, bacteria, insects, and small animals—everything their company poisoned on earth for a profit. (The company's number-one product was a pesticide.) Of the several thousand products this company made, none were invited along on the trip. The designers realized they were too toxic to be released in a small environment, that being a spaceship five miles in diameter. Essentially, the winning team created a diverse ecosystem within which a socially just and equitable society practiced organic agriculture and designed all objects for disassembly, reuse, and recycling. When the participants were asked if it was fair that 20 percent of the passengers received 80 percent of the fruits, vegetables, and medicines produced onboard, all of them, including the vice president who had been disgusted with the idea of equity, shouted the idea down and agreed that it would be unacceptable. Then the VP realized what he had said. After the exercise, a group of employees began an organic garden at headquarters, and several engineers quit their jobs.

The power of the spaceship model is not only metaphorical but also pedagogical. It teaches systems thinking, a holistic approach to the interaction and interdependence of constituent parts and how they function together over time. How we came to believe that the earth could support disposables, heavy-metal contamination, Superfund sites, and nuclear testing is a question I leave to cultural historians. Despite centuries-long practices of despoliation and pollution, almost every responsible corporation in the world is moving away from destructive practices and trying to institute more sustainable ones, and all of them have turned to NGOs to assist, teach, inspire, and urge them on. The stereotype of civil society is groups resisting corporations, and that is true as outlined in previous chapters. What is also true, however, is that nonprofit groups have formed productive relationships with corporations to help them develop in more benign ways. Wal-Mart, which has been in the crosshairs of nonprofits for just about every possible issue for more than a decade, has made a commitment to sustainable practices in every aspect of its business. These include tripling the efficiency from 6 to 18 mpg in what is the biggest truck fleet in the world, converting to 100 percent renewable energy, and going to a zero-waste system where nothing is thrown away. To achieve those goals, Wal-Mart actively consults with dozens of NGOs on topics that include seafood, organic food and farming, textiles, climate change, China, electronics and waste, jewelry, chemicals, green chemistry, logistics, forest products and certification, green buildings, transportation, packaging, and renewable energy. (It is important to note that an equally large group of NGOs continues to oppose Wal-Mart's siting, labor, and business practices.)

A wasteful society is a relatively new phenomenon. I spent part of my childhood on a farm belonging to my Swedish grandmother and Scottish grandfather, where nothing much was thrown away. The barn was full of used washers, bolts, wire, and doodads. In the kitchen every other plate was chipped, but the china never left the dinner table with food on it. Gravy and juices were mopped up by homemade bread, vegetable peelings went to the chickens, the shells from the eggs eaten at breakfast were put into the coffee grounds, the coffee grounds were placed into the compost, the compost was tilled into the garden, the tomatoes and corn from the garden were sealed in glass jars that joined the jams and jellies lining cool, dark basement

walls. Paper lunch bags were brought back from school and neatly folded for use the next day. Our idea of play included capturing horned toads and pretending they were dinosaurs or lying faceup in irrigation ditches, the tiny fry tickling our toes, and imagining we were floating down a great Amazonian river. Our notion of a toy was a bald tire swinging from the sycamore. Had my grandparents been from Chile, Korea, or Kerala, life essentially would have been the same. Nothing would have been wasted.

Today, the creation of a zero-waste society is a global movement carried out by thousands of organizations. The ostensible purpose is to institute cyclical systems that eliminate waste by design, not by management at end-of-pipe. Zero-waste strategies have intellectual origins in the thinking of Walter Stahel of the Product Life Institute in Switzerland and biologist John Todd of the New Alchemy Institute in Cape Cod, Massachusetts. Stahel coined the term "cradle to cradle" in 1985 in connection with the cyclical use of materials. About three-fourths of all energy is used to extract and produce basic materials such as steel, and the balance is used to finish raw materials into products. Conversely, three-fourths of industrial employment is deployed in manufacturing goods, and only one-fourth is in raw materials extraction. By closing the loop so that recycled instead of virgin materials are employed in manufacturing, energy use plummets and employment increases. John Todd is a genius in the design of aquatic systems, and based on his work Yale architecture student Paul Bierman-Lytle coined the term "waste equals food" to express the concept that waste from one system should provide food for another, whether industrial system or ecosystem. Todd envisaged industrial and municipal effluent as a potential nutrient source rather than as water pollution, and proceeded to design a water treatment process using living organisms and plants to transform them into safe, nontoxic nutrients. Buckminster Fuller perceived what all thermodynamicists know, that spaceship earth is powered by a mother ship, the sun, and that to sustain the earth we need to run off current solar income. Dipping into the carbon bank of the past is not only tantamount to going into debt, it overwhelms the waste absorption capacity of the earth (which is exactly what global greenhouse gases do). That trilogy of concepts—cradle to cradle, waste equals food, and stay within current solar income—lays out the basic tenets of the greening of industry and elimination of pollution, waste, and toxins. It could not be more clear.

Beyond elimination of material waste resides a deeper issue: the elimination of waste on a social level. We are the only species without full employment,

again defying the nature of nature. No academic yet has satisfactorily explained the wisdom of an economic system that marginalizes human beings. A zero-waste society means wasting nothing, and foremost among these resources are people, especially children. If we are to care for our children, then we must address the needs of their mothers and fathers. Tens of thousands of organizations in the movement create dignified, living-wage jobs for impoverished men and women. They work in villages, communities, and rural areas, attacking the challenge job by job. At the same time, NGOs will mass or swarm to protest treaties such as NAFTA that put small farmers out of business in Chiapas.

Life tends to optimize rather than maximize. Maximization is another word for addiction. "Humans exhibit addictive tendencies when trying to maximize such values as wealth, pleasure, security, and power. . . . Too much of a good thing is not a good thing,"[19] writes Hoagland. Critics of the movement complain that it is against free markets, expanding wealth, and security, which is not true. What is missing in that critique is a discussion of how we gauge sufficiency. A sense of balance—of knowing what is too much wealth, what is too much power, what constitutes license instead of freedom—is not easy to achieve, but it raises crucial questions. In *Lyrical and Critical Essays*, Camus wrote of how beauty has been exiled in Western culture and replaced by the cult of reason that constantly seeks to overcome limits. "But limits nonetheless exist and we know it. In our wildest madness we dream of an equilibrium we have lost, and which in our simplicity we think we shall discover once again when our errors cease—an infantile presumption, which justifies the fact that childish peoples, inheriting our madness, are managing our history today. . . . We turn our back on nature, we are ashamed of beauty. Our miserable tragedies have the smell of an office, and their blood is the color of dirty ink."[20]

While so much is going wrong, so much is going right. Over the years the ingenuity of organizations, engineers, designers, social entrepreneurs, and individuals has created a powerful arsenal of alternatives. The financial and technical means are in place to address and restore the needs of the biosphere and society. Poverty, hunger, and preventable childhood diseases can be eliminated in a single generation. Energy use can be reduced 80 percent in developed countries within thirty years with an improvement in the quality of life, and the remaining 20 percent can be replaced by renewable

sources. Living-wage jobs can be created for every man and woman who wants one. The toxins and poisons that permeate our daily lives can be completely eliminated through green chemistry. Biological agriculture can increase yields and reduce petroleum-based pollution into soil and water. Green, safe, livable cities are at the fingertips of architects and designers. Inexpensive technologies can decrease usage and improve purity so that every person on earth has clean drinking water. So what is stopping us from accomplishing these tasks?

It has been said that we cannot save our planet unless humankind undergoes a widespread spiritual and religious awakening. In other words, fixes won't fix unless we fix our souls as well. So let's ask ourselves this question: Would we recognize a worldwide spiritual awakening if we saw one? Or let me put the question another way: What if there is already in place a large-scale spiritual awakening and we are simply not recognizing it?

In a seminal work, *The Great Transformation,* Karen Armstrong details the origins of our religious traditions during what is called the Axial Age, a seven-hundred-year period dating from 900 to 200 BCE, during which much of the world turned away from violence, cruelty, and barbarity. The upwelling of philosophy, insight, and intellect from that era lives today in the works of Socrates, Plato, Lao-tzu, Confucius, Mencius, Buddha, Jeremiah, Rabbi Hillel, and others. Rather than establishing doctrinaire religious institutions, these teachers created social movements that addressed human suffering. These movements were later called Buddhism, Hinduism, Confucianism, monotheistic Judaism, democracy, and philosophical rationalism; the second flowering of the Axial Age brought forth Christianity, Islam, and Rabbinical Judaism. The point Armstrong strongly emphasizes is that the early expressions of religiosity during the Axial Age were not theocratic systems requiring belief, but instructional practices requiring action. The arthritic catechisms and rituals that we now accept as religion had no place in the precepts of these sages, prophets, and mystics. Their goal was to foster a compassionate society, and the question of whether there was an omnipotent God was irrelevant to how one might lead a moral life. They asked their students to question and challenge and, as opposed to modern religion, to take nothing on faith. They did not proselytize, sell, urge people to succeed, give motivational sermons, or harangue sinners. They urged their followers to change how they behaved in the world. All relied on a common principle, the Golden Rule: Never do to anyone what you would not have done to yourself.[21]

> The Axial sages were not interested in providing their disciples with a little edifying uplift, after which they could return with renewed vigor to their ordinary self-centered lives. Their objective was to create an entirely different kind of human being. All the sages preached a spirituality of empathy and compassion; they insisted that people must abandon their egotism and greed, their violence and unkindness. Not only was it wrong to kill another human being; you must not even speak a hostile word or make an irritable gesture. Further, nearly all of the Axial sages realized that you could not confine your benevolence to your own people: your concern must somehow extend to the entire world. . . .If people behaved with kindness and generosity to their fellows, they could save the world.[22]

No one in the Axial Age imagined that he was living in an age of spiritual awakening. It was a difficult time, riddled with betrayals, misunderstandings, and petty jealousies. But the philosophy and spirituality of these centuries constituted a movement nevertheless, a movement we can recognize in hindsight. Just as today, the Axial sages lived in a time of war. Their aim was to understand the source of violence, not to combat it. All roads led to self, psyche, thought, and mind. The spiritual practices that evolved were varied, but all concentrated on focusing and guiding the mind with simple precepts and practices whose repetition in daily life would gradually and truly change the heart. Enlightenment was not an end—equanimity, kindness, and compassion were.

These teachings were the original source of charities in the ancient world, and they are the true source of NGOs, volunteerism, trusts, foundations, and faith-based charities in the modern world. I suggest that the contemporary movement is unknowingly returning the favor to the Axial Age, and is collectively forming the basis of an awakening. But it is a very different awakening, because it encompasses a refined understanding of biology, ecology, physiology, quantum physics, and cosmology. Unlike the massive failing of the Axial Age, it sees the feminine as sacred and holy, and it recognizes the wisdom of indigenous peoples all over the world, from Africa to Nunavut.

I have friends who would vigorously protest this assertion, pointing out the small-mindedness, competition, and selfishness of a number of NGOs and the people who lead them. But I am not questioning whether

the human condition permeates the movement. It does so, most surely. Clay feet march in all protests. My question is whether the underlying values of the movement are beginning to permeate global society. And there is even a larger issue, the matter of intent. What is the intention of the movement? If you examine its values, missions, goals, and principles, and I urge you to do so, you will see that at the core of all organizations are two principles, albeit unstated: first is the Golden Rule; second is the sacredness of all life, whether it be a creature, child, or culture. The prophets we now enshrine were ridiculed in their day. Amos was constantly in trouble with the authorities. Jeremiah became the root of the word *jeremiad,* which means a recitation of woes, but like Cassandra, he was right. David Suzuki has been prescient for forty years. Donella Meadows was prophetic about biological limits to growth and was scorned by fellow scientists. Bill McKibben has been unwavering and unerring in his cautions about climate change. Martin Luther King was killed one year after he delivered his "Beyond Vietnam" address opposing the Vietnam War and berating the American military for "taking the young black men who have been crippled by our society and sending them 8,000 miles away to guarantee liberties in Southeast Asia which they had not found in southwest Georgia and East Harlem."[23] Jane Goodall travels three hundred days a year on behalf of the earth, speaking, teaching, supporting, and urging others to act. Wangari Maathai was denounced in Parliament, publicly mocked for divorcing her husband, and beaten unconscious for her work on behalf of women and the African environment. It matters not how these six and other leaders will be seen in the future; for now, they are teachers who try or have tried to address the suffering they witness on earth.

I once watched a large demonstration while waiting to meet a friend. Tens of thousands of people carrying a variety of handmade placards strolled down a wide boulevard accompanied by chants, slogans, and song. The signs referred to politicians, different species, prisoners of conscience, corporate campaigns, wars, agriculture, water, workers' rights, dissidents, and more. Standing near me a policeman was trying to understand what appeared to be a political Tower of Babel. The broad-shouldered Irishman shook his head and asked rhetorically, "What do these people want?" Fair question.

There are two kinds of games—games that end, and games that don't. In the first game the rules are fixed and rigid. In the second, the rules change whenever necessary to keep the game going. James Carse called

these, respectively, finite and infinite games.[24] We play finite games to compete and win. They always have losers and are called business, banking, war, NBA, Wall Street, and politics. We play infinite games to play; they have no losers because the object of the game is to keep playing. Infinite games pay it forward and fill future coffers. They are called potlatch, family, samba, prayer, culture, tree planting, storytelling, and gospel singing. Sustainability, ensuring the future of life on earth, is an infinite game, the endless expression of generosity on behalf of all. Any action that threatens sustainability can end the game, which is why groups dedicated to keeping the game going assiduously address *any* harmful policy, law, or endeavor. With no invitation, they invade and take charge of the finite games of the world, not to win but to transform finite games into infinite ones. They want to keep the fish game going, so they go after polluters of rivers. They want to keep the culture game going, so they confront oil exploration in Ecuador. They want to keep the hope game alive in the world, so they go after the roots of poverty. They want to keep the species game happening, so they buy swaths of habitat and undeveloped land. They want to keep the child game going; consequently, when the United States violated the Geneva Conventions and bombed the 1,400 Iraqi water and sewage treatment plants in the first Gulf War, creating sewage-, cholera-, and typhus-laden water, they condemned it as morally repugnant. When the same country that dropped the bombs persuaded the United Nations to prevent shipments of chlorine and medicine to treat the resulting diseases, the infinite-game players thought it hideous and traveled to the heart of that darkness to start NGOs to serve the abandoned. People trying to keep the game going are activists, conservationists, biophiles, nuns, immigrants, outsiders, puppeteers, protesters, Christians, biologists, permaculturists, refugees, green architects, doctors without borders, engineers without borders, reformers, healers, poets, environmental educators, organic farmers, Buddhists, rainwater harvesters, meddlers, meditators, mediators, agitators, schoolchildren, ecofeminists, biomimics, Muslims, and social entrepreneurs.[25]

David James Duncan penned a response to the hostile takeover of Christianity by fundamentalists, with advice that applies to all fundamentalisms: the people of the world do not need religious fanatics to save them any more than they need oleaginous free-trade hucksters to do so; they need *us* for their salvation, and *us* stands for the crazy-quilt assemblage of global humanity that is willing to stand up to the raw, cancerous insults that come from the mouths, guns, checkbooks, and policies of ideologues

movement is not merely trying to prevent wrongs but actively seeks to love this world. Compassion and love of others are at the heart of all religions, and at the heart of this movement. "When small things are done with love it's not a flawed you or me who does them: it's love. I have no faith in any political party, left, right, or centrist. I have boundless faith in love. In keeping with this faith, the only spiritually responsible way I know to be a citizen, artist, or activist in these strange times is by giving little or no thought to 'great things' such as saving the planet, achieving world peace, or stopping neocon greed. Great things tend to be undoable things. Whereas small things, lovingly done, are always within our reach."[26] Some people think the movement is defined primarily by what it is against, but the language of the movement is first and foremost about keeping the conversation going, because ideas that inform it never end: growth without inequality, wealth without plunder, work without exploitation, a future without fear.[27] To answer the policeman's question, "these people" are reimagining the world.

To salve the world's wounds demands a response from the heart. There is a world of hurt out there, and to heal the past requires apologies, reconciliation, reparation, and forgiveness. A viable future isn't possible until the past is faced objectively and communion is made with our errant history. I suspect that just about everyone owes an apology and merits one, but there are races, cultures, and people that are particularly deserving. The idea that we cannot apologize to former enslaved and first peoples for past iniquities because we are not the ones who perpetuated the evil misses the point. By receiving sorrow, hearing admissions, allowing reparation, and participating in reconciliation, people and tribes whose ancestors were abused give new life to all of us in the world we share. Making amends is the beginning of the healing of the world. These spiritual deeds and acts of moral imagination lay the groundwork for the great work ahead.[28]

The movement is not coercive, but it is relentless and unafraid. It cannot be mollified, pacified, or suppressed. There can be no Berlin Wall moment, no treaty to sign, no morning to awaken to when the superpowers agree to stand down. This is a movement away from the maximization of anything that is not conducive to life. It will continue to take myriad forms. It will not rest. There will be no Marx, Alexander, or Kennedy to lead it. No book can explain it, no person can represent it, no group can stand at its forefront, no words can encompass it, because the movement is the breathing, sentient testament of the living world. The movement is an outgrowth of apostasies and it is now self-generating. The first cells that assembled and

metabolized under the most difficult of circumstances deep in the ocean nearly 40 million centuries ago are in our bodies now, and we are, in Mary Oliver's words, determined, as they were then, to save the only life we can.[29] Life can occur only in a cell, and a cell is where all disease starts, as well. In Franklin Harold's book *The Way of the Cell,* he points out that for all its hard-bitten rationalism, molecular science asks us to accept a "real humdinger . . . that all organisms have descended . . . from a single ancestral cell."[30] This quivering, gelatinous sensate mote is the core of everything we cherish, and places us in direct relation to every other form of life. That primordial connection, so incomprehensible to some yet so manifest and sacred and incontestable to others, links us inseparably to our common fate. The first gene was the password to all subsequent forms of life, and the word *gene* has the same etymological root as the words *kin, kind, genus, generous,* and *nature.* It is our nature to cultivate life, and this movement is a collective kindness produced over the course of 4 million millennia.

I believe this movement will prevail. I don't mean it will defeat, conquer, or create harm to someone else. Quite the opposite. I don't tender the claim in an oracular sense. I mean that the thinking that informs the movement's goals will reign. It will soon suffuse most institutions, but before then, it will change a sufficient number of people so as to begin the reversal of centuries of frenzied self-destructive behavior. Some say it is too late, but people never change when they are comfortable. Helen Keller threw aside the gnawing fears of chronic bad news when she declared, "I rejoice to live in such a splendidly disturbing time!" In such a time, history is suspended and thus unfinished. It will be the stroke of midnight for the rest of our lives.

My hopefulness about the resilience of human nature is matched by the gravity of our environmental and social condition. If we squander all our attention on what is wrong, we will miss the prize: In the chaos engulfing the world, a hopeful future resides because the past is disintegrating before us. If that is difficult to believe, take a winter off and calculate what it requires to create a single springtime. It's not too late for the world's largest institutions and corporations to join in saving the planet, but cooperation must be on the planet's terms. The "Help Wanted" signs are everywhere. All people and institutions, including commerce, governments, schools, churches, and cities, need to learn from life and reimagine the world from the bottom up, based on first principles of justice and ecology. Ecological restoration is extraordinarily simple: You remove whatever prevents the system from healing itself. Social restoration is no different. We have the heart, knowledge,

money, and sense to optimize our social and ecological fabric. It is time for all that is harmful to leave. One million escorts are here to transform the nightmares of empire and the disgrace of war on people and place. We are the transgressors and we are the forgivers. "We" means all of us, everyone. There can be no green movement unless there is also a black, brown, and copper movement. What is most harmful resides within us, the accumulated wounds of the past, the sorrow, shame, deceit, and ignominy shared by every culture, passed down to every person, as surely as DNA, a history of violence, and greed. There is no question that the environmental movement is critical to our survival. Our house is literally burning, and it is only logical that environmentalists expect the social justice movement to get on the environmental bus. But it is the other way around; the only way we are going to put out the fire is to get on the social justice bus and heal our wounds, because in the end, there is only one bus. Armed with that growing realization, we can address all that is harmful externally. What will guide us is a living intelligence that creates miracles every second, carried forth by a movement with no name.

APPENDIX

It is perhaps not too much to say that, in the first decade of the new millennium, humanity has entered into a condition that is in some sense more globally united and interconnected, more sensitized to the experiences and suffering of others, in certain respects more spiritually awakened, more conscious of alternative future possibilities and ideals, more capable of collective healing and compassion, and, aided by technological advances in communication media, more able to think, feel, and respond together in a spiritually evolved manner to the world's swiftly changing realities than has ever before been possible.

—Richard Tarnas*

No one knows how many nonprofit organizations exist in the world, and it is unlikely anyone ever will. They come and go, not as quickly as some suggest, but in sufficient numbers to defy a meaningful count. There are organizations and institutes that track this information, but the data presented are scant and concentrate on established urban organizations. Smaller nonprofit organizations can exist for years in many countries before they are recognized or counted, if ever. The Internet has created virtual organizations that may only have one full-time employee but a network of correspondents, volunteers, and part-time activists. Developed countries count nonprofits through tax rolls, but some organizations can be excluded as several may function under one roof. Some social entrepreneurs operate out of their laptop and never form an organization. Data about nonprofits vary widely in different parts of the world and are never definitive, due to the lack of accurate, up-to-date lists. Where government regimes are oppressive, nonprofits will hide within informal networks and shadow economies that mask their presence to authorities. After reading books, reports, government registries, and monographs, I believe researchers underestimate the extent of civil society; there may be as many as ten million nonprofits in the world. Of that number, there are at least one million nonprofit organizations addressed by this book, groups that address the environment, indigenous rights, and social justice.

In order to write *Blessed Unrest* I needed to do more than assert the existence of these organizations, and I had to define what is meant by the words "the environment, indigenous rights, and social justice." Those catchphrases mask the depth and breadth of this humanitarian movement. To begin to solve the problem, my colleagues and I at the Natural Capital Institute, a California-based nonprofit research institution, created a database of civil society organizations from around the world directed to the issues of the environment and justice. It is now the largest database of its kind, listing organizations in 243 countries, territories, and sovereign islands. As impressive as the number of organizations is, equally important is the classification scheme that emerged

*Richard Tarnas, *Cosmos and Psyche, Intimations of a New World View* (New York: Viking, 2006), p. 483.