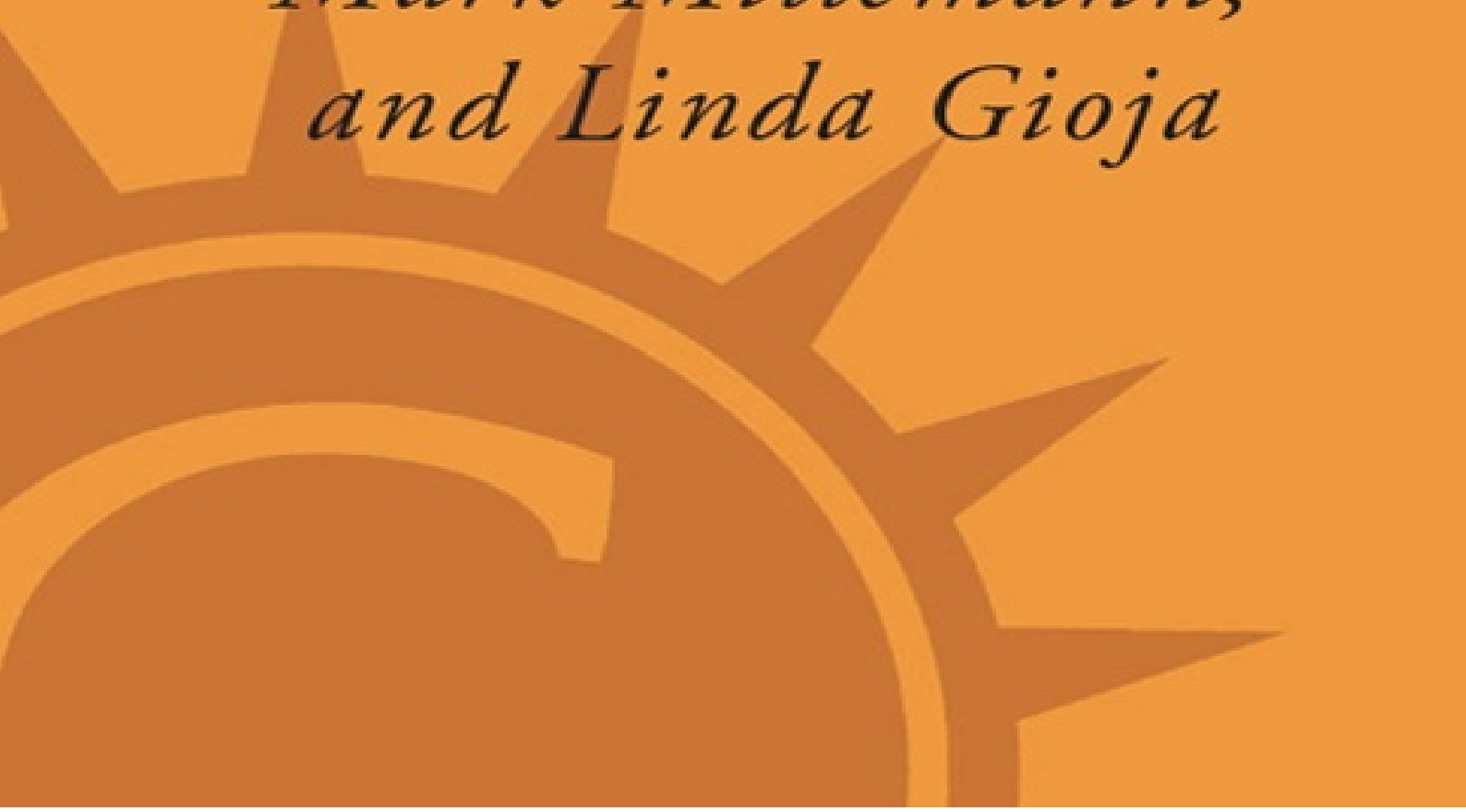
SURFING THE EDGE OF CHAOS

The New Art and Science of Management

Richard Pascale,
Mark Millemann,
and Linda Gioja



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MANAGEMENT AND THE SCIENTIFIC RENAISSANCE

There is a new scientific renaissance in the making. It will usher in new industries, alter ho businesses compete, and change how companies are managed. This book explores the manageri implications of this new renaissance.

Scientific discovery shapes managerial thinking. Principles identified more than two hundred years ago, during an earlier scientific renaissance, have had wide influence on how managers think today. Derivative ideas from Newton's laws of motion and his early work on gas thermodynamics were literally lifted, equation by equation, and applied to the emerging field of economics.[1] When they we extended into the realm of enterprise, these applications shaped the practice of management and today's deep-seated beliefs about change.

We are entering another scientific renaissance. The magnets for the inquiry are called *complex adaptive systems.* Also known as "complexity science," this work grapples with the mysteries of life itself, and is propelled forward by the confluence of three streams of inquiry: (1) breakthrough discoveries in the life sciences (e.g., biology, medicine, and ecology); (2) insights of the social sciences (e.g., sociology, psychology, and economics); and (3) new developments in the hard science (e.g., physics, mathematics, and information technology). The resulting work has revealed exciting insights into life and has opened up new avenues for management.[2]

Efforts to understand life are as old as humanity itself. For uncounted millennia, they centered on the selective breeding of animals and plants to improve yields and reduce susceptibility to disease. By th time the first scientific renaissance ended in the 1880s, geneticist Gregor Mendel had unlocked the secrets of heredity.[3] Selective breeding, formerly an art, fell within the grasp of science.

A second milestone of great consequence was the discovery, in 1953, of the double helix of DNA by James Watson and Francis Crick.[4] By the end of the twentieth century, the vast new frontier they had opened was closing in on both understanding, and possibly altering, the biochemistry of life.

For several decades after Watson and Crick's discoveries, efforts to decipher DNA sequences and other facets of living systems were thwarted by their enormous complexity. But powerful computers and arcane technology for observing microscopic organisms and genetic dynamics permitted considerable progress. A trickle of breakthroughs began. Among them was the capacity to identify particular genes that made a plant or animal resistant to disease or amplified desirable features. By th 1990s, Genenech, Amgen, Immunex, Monsanto, and a host of other firms were developing biotechnology to the point where patented pharmaceuticals and seeds had become commercial realities. These nascent capabilities are accompanied, in turn, by new challenges—business, ethical, and social.

Many subterranean streams have combined to form the current flow of interest in living system Most attention is galvanized by the extraordinary economic potential of biotechnology or the soci consequences of vanishing rain forests and global warming. However, another tributary will prove a important as all the rest: Understanding the mysteries of life will alter how we think abo organizations, management, and social change.

Businesses, it turns out, can learn a great deal from nature. Besides providing an account of pathbreaking applications of living systems theory to management, this book reveals how cornerston principles of the life sciences have been translated into practice and have considerably improved the odds of success in achieving discontinuous change.

The New "Life" Cycle

The industrial revolution was fueled by the earlier scientific renaissance. It was predicated on th machine model of take → make → break: taking raw materials, converting them into products, an eventually "breaking"—in two meanings of the word—both breaking environmental and soci balance through high-impact extraction and production techniques, and by fostering a spiral obsolescence in which the products are used and discarded. Clear-cut forests, rusting machinery, an the heaping detritus of salvage yards are the fossil remains of this era.

The emerging life science model unfolds like a species in a new ecological niche: innovate → proliferate → aggregate. Nature favors adaptation and fleet-footedness. Most species compete when they must, but organisms strive, when possible, to reproduce more rapidly than their rivals and to dominate by sheer strength of numbers. Economists call this "increasing returns." Discovering a new niche and proliferating rapidly fosters ubiquity. One witnesses it in commerce when Microsoft Windows, or a brand franchise such as Amazon.com, or the QWERTY sequence of a keyboard becomes the *lingua franca* for an industry or technology. Major families may join forces to create self-reinforcing arrangements. In nature, in the benevolent exchange between insects and plants, nectar is swapped for pollination services. In business, the merger of AOL with Time Warner is an effort to establish supremacy through aggregation in the e-business and communications industries.

Of Colonies and Companies

Rapid rates of change, an explosion of new insights from the life sciences, and the insufficiency of th machine model have created a critical mass for a revolution in management thinking. The fallout the scientific renaissance has fostered uncertainty and soul-searching.[5] Executives ask: How do w make practical sense of all this? How do we get the change and performance we need? Clues, it turn out, are to be found in the world of the termite.

Come with us to a remarkable structure: the twelve-foot-high mound of the African termite, home to millions of inhabitants.[6]

The mound is an architectural marvel. Naturalist Richard Conniff has described its perfect arches, spiral staircases, nurseries, storage facilities, and living quarters that vary with the status of individua termites. Tunnels radiate out from the mound more than 160 feet in any direction. These structures enable the termites to forage for grass, wood, and water within an 80,000-square-foot area without

being exposed to predators.[7]

Within the mound, a ventilation system—operated by opening and closing vents—creates a motion similar to respiration. Oxygen is "inhaled" into the twelve-foot tower of mud, and carbon dioxide is "exhaled." The system also holds the internal temperature steady (plus or minus one degree Fahrenheit) even though the external climate ranges from freezing winters to 100-degree-plus summers. Humidity is constant at 90 percent.[8]

This organizational wonder—which evolved over 100 million years or so—is a tribute to an elaborat social structure. Every inhabitant obeys a series of genetically programmed *rules*, such as: "Position yourself between the termite in front and the one behind, and pass on whatever comes your way." As whole, members of the mound constitute a sophisticated society that makes it possible to meet the ever changing needs of the colony.[9]

Entomologists have known about the workings of the termite for centuries. In the past two decades, though, a group of leading scientists has offered a different, intriguing perspective. They see the mound as a stunning example of a *complex adaptive system.*

A complex adaptive system is formally defined as a system of independent agents that can act in parallel, develop "models" as to how things work in their environment, and, most importantly, refine those models through learning and adaptation.[10] The human immune system is a complex adaptive system. So is a rain forest, a termite colony, and a business.

Over the past several years, substantial literature has introduced the new science of *complexity*. This a broad-based inquiry into the common properties of all living things—beehives and bond traders, an colonies and enterprises, ecologies and economies, you and me. In aggregate, the coverage on this topic to date has achieved two significant things:

It has evoked wonder and excitement about the living world around us—how life surges and decline how nature competes, cooperates, and thrives on change.

It has whetted some managerial appetites for a new approach that might help to unshackle th potential of people and organizations and has begun to challenge the machine model as a suitab management platform for the information age.

We aim to take a step beyond. This book describes a new management model based on the nature of nature, but it also does what no other book has done before. It distills, from the science of complexity four bedrock principles that are inherently and powerfully applicable to the living system called a business.

In brief, these principles are:

Equilibrium is a precursor to *death.* When a living system is in a state of equilibrium, it is le responsive to changes occurring around it. This places it at maximum risk.

In the face of threat, or when galvanized by a compelling opportunity, living things move toward th *edge of chaos.* This condition evokes higher levels of mutation and experimentation, and fresh ne solutions are more likely to be found.

When this excitation takes place, the components of living systems *self-organize* and new forms an repertoires *emerge* from the turmoil.

Living systems cannot be *directed* along a linear path. Unforeseen consequences are inevitable. Th challenge is to *disturb* them in a manner that approximates the desired outcome.

If properly employed, these principles allow enterprises to thrive and revitalize themselves. In contrast, the machine-age principles, although familiar and enduring, often quietly facilitate the stagnation and decline of traditional enterprises that are faced with discontinuous change.

The choice is that simple and that stark.

Complexity and *chaos* are frequently used interchangeably, even though they have almost nothing in common. The world is not chaotic; it is complex.

Humans tend to regard as chaotic that which they cannot control. This creates confusion over what is meant by the term *chaos*. From a scientific point of view, chaos is that unlikely occurrence in which patterns cannot be found nor interrelationships understood.[11] A swarm of bees or the ants that overrun a picnic blanket may seem chaotic but they are actually only behaving as a complex adaptive systems E-commerce and the upending of traditional business platforms may feel "chaotic," but, technically, these innovations are complex.

Living Systems Pioneers

Let us be clear. "Living systems" isn't a metaphor for how human institutions operate. It's the way is.[12] Pioneering efforts by the companies described herein have demonstrated that ideas can produce concrete bottom-line impact and profound transformational change. Indeed, some of the largest an most successful organizational transformations during recent years have been modeled on th principles of living systems. This book was largely inspired by business leaders who not on embraced those principles as their guidelines for change, but also, through trial and error, found way to translate them into concrete management practices.

Surfing the Edge of Chaos bridges theory and practice through six in-depth examples of living systems: British Petroleum, Hewlett-Packard, Monsanto, Royal Dutch/Shell, Sears, and the U.S. Army. We have observed leaders who explicitly or implicitly regarded their organizations as living systems and employed the four principles described above as a superior management platform in revitalizing their enterprises. We have seen executives consciously put these insights into practical use and create demonstrable successes that most probably could not have been achieved otherwise. Most business books have examples, but few take the long view and trace the ups and downs. We discuss both the successes and the failures.

There is no mystery—no secret formula, no magic potion—about the way the living systems model works. The examples identify insights about complex adaptive systems as they operate in the natural world and translate them to the world of business. Sensible lessons are gathered from observing the pitfalls and triumphs experienced by companies that have adopted the new model.

Our personal advisory relationships with the CEOs and other senior leaders in most of the six organizations provide intimate accounts of what transpired, not anecdotal or journalistic treatments.

These accounts point toward practical design principles and processes and toward tools that can be used to unleash the potential of an organization. A fresh and unorthodox brand of leadership is necessary to initiate and shepherd an adaptive journey. Finally, we identify core disciplines that enable an organization to *sustain* its vitality once it has been reawakened.

Those are our promises for this book.

We do not propose that the four principles stated earlier form a new silver bullet. The practices that stem from them are not foolproof; indeed, they are not always superior to traditional approaches. As we shall see shortly, a lot depends on the challenge faced and the magnitude of change sought.

“Concrete” Examples

In Mexico, Cemex, the world’s third largest (and only global) cement company, dispatches its fleet c cement mixers based on the same simple rules that govern how ants scavenge a colony’s territory wi ruthless efficiency. Cemex recognizes what homeowners know only too well: Construction projec *never* proceed on schedule. Schedule a cement delivery in advance and you can bank on the site being ready earlier (high-cost workers then hang around awaiting the delivery with nothing to do) not being ready as planned (the cement then starts to harden in the truck).

Suppliers and customers alike have unhappily accepted this state of affairs for years. Logically speaking, how could it be otherwise when the construction site’s state of readiness is dependent on so many unpredictable elements? But Cemex defies that logic. It promises to provide cement *where* you want it and *when* you want it, on two hours’ notice. Cemex sells promises—not just cement—and use them as compelling marketplace differentiators. And Cemex delivers.

How is it possible?

Cemex loads its fleets of cement trucks each morning and dispatches them with no preordained destination. The trick lies in how they make their rounds. Like ants scavenging a territory, they are guided to their destination by simple rules. Ants use chemical messages (called pheromones) to convey these instructions; Cemex uses an algorithm based on *greed* (deliver as much cement as rapidly as possible to as many customers as possible) and *repulsion* (avoid duplication of effort by staying as far away from other cement trucks as possible). It’s scary to have a fleet loaded with, of al products, wet cement, which could harden before it is delivered. Yet the ant model works with remarkable efficiency. Cemex has obliterated competition in the eight nations where it operates (including the western and southwestern regions of the United States). Cemex’s decision to emulate a living system delivers an incremental return of $388 million per year to the bottom line.[13]

A fluke? Not hardly. In 1998, British Telcom introduced a similar system to dispatch its service fleet of 80,000 vehicles. Savings in the first year: £250 million.[14] The U.S. Army employed the ant pheromone model to direct its drone ground surveillance coverage in Bosnia and Serbia (and to redirect drones when one was shot down). Coverage efficiency increased from 60 percent (using the old mainframe-based optimization model) to 87 percent (feeding the ant algorithm into a battle-hardened personal computer).[15]

Cemex has adopted one of the simplest applications of complexity science. Our corporate examples extend considerably beyond this realm. At Monsanto (now merged with Upjohn to form Pharmacia),

CEO Robert Shapiro embraced the framework of living systems as the centerpiece of his efforts to reinvent a lackluster manufacturer of low-margin petrochemicals as a leading life-sciences enterpris

As subtext to this story, Shapiro, a longtime McKinsey client, had to mind-wrestle with the partners the formidable consulting firm. Instead of the top-down strategic reinvention that McKinsey was advocating, Shapiro persuaded the members of the consulting team to play the role of stewards and facilitators.

Over 10,000 Monsanto employees became involved in 300 cross-business and cross-functional teams Within that context, workers freed of top-side direction identified new business opportunities. The campaign to implement these initiatives generated tensions that moved the company toward the edge of chaos. Self-organizing groups sparked dozens of breakthrough innovations and a staggering reduction in costs. Share price soared from $15 to $49. Along the way, Shapiro radically changed Monsanto's strategy and culture.[16]

Monsanto's transformation from an undifferentiated also-ran to a front-runner in genetically engineered crops impacted the world community in unforeseen ways. Opposition to bioengineering mounted, changing the companies' future.[17] Monsanto was confronted with another kind of disruptive change—one that was played out in the spotlight of media attention and shifting world opinion.

Management: Past and Future Tense

We have noted that contemporary business practices can trace their managerial heritage to th scientific work of Newton (irreducible and mathematical laws explaining the mechanics of nature) an Dalton (dividing complex molecules into individual atoms, and observing the interaction of molecul under pressure as the precursor to thermodynamics). As *The Wall Street Journal*'s Thomas Petzing explains:[18]

> [From the 1680s onward], Isaac Newton was the new Moses, presenting a few simple equations—the laws of nature—which nev failed in predicting the tides, the orbit or movement of any object that could be seen or felt. Output was exactly proportional input. Everything was equal to the sum of its parts. Newton's mechanics seemed so perfect, so universal, that they became t organizing principles of all post-feudal society, including armies, churches, and economic institutions of every kind. . . . The ve equations of economics, including many we use today, were built explicitly on the principles of mechanics and thermodynamic right down to the terms and symbols. The economy was said to "have momentum," was "well oiled" or "gaining steam."
>
> As a model for everything, Newtonianism, it turned out, had limitations. It worked only within the narrow range of Newton instruments. The "laws of nature" fell to pieces in space, as Einstein's relativity physics showed, and at the subatomic level, quantum physics showed. Scientists realized that however useful in solving smooth, mechanical problems, Newton's calculus w meaningless in understanding the vast preponderance of nature: the motion of currents, the growth of plants, the rise and fall civilizations.

Einstein's insight into relativity—overturning, as it did, the orderly world of classical physics—exerted broad influence over many other disciplines. Early in the twentieth century, relativism was mirrored in art (Picasso and Pollack), poetry (T. S. Eliot), music (Stravinsky), literature (James Joyce), and interpretative religion. Object and observer became inseparable. Structure was connected to process, the medium to the message, doing to being. The rational and analytical were inseparable from the emotional and intuitive.[19]

Except in management. The reason is plain enough: If it ain't broke, don't fix it. For the greater part of the century, particularly from the 1950s onward, dazzling new technologies (electronics, engineer

materials, computers, and bioengineering, to name a few) opened vast frontiers of commerce in whic traditional management models flourished. Factor in fifty-five years without destructive global conflict and the result was the emergence of industrial economies with vast wealth, spending power, and consumer appetites. A good part of the twentieth century, excluding the Great Depression and the war years, may be regarded as an era of low-hanging fruit. In short, management didn't change because it didn't have to. True to Woody Allen's quip that 90 percent of life is just showing up, our large and lumbering corporations thrived because they showed up; their lack of agility was not a significant drawback, given their advantages of scale and the cornucopia of economic opportunity spread before them.

Then some unlikely startups, borne on the wings of new business models, proceeded to spoil the party. The newcomers—companies like Amazon.com, Southwest Airlines, Home Depot, and Nokia—ran rings around traditional companies mired in their comfortable equilibrium.

Gradually, a new consensus began to form within the ranks of management experts. It recognized that companies with talent and the instincts to innovate and collaborate can commercialize ideas and seize the high ground before slower, well-established rivals even spot the new hill. It held that by inspiring frontline workers to operate as independent agents, pursuing their own solutions with little central control, formidable business enterprises and social movements can emerge.

But beware: While this new agile species exploits some elements of complexity, a halfway understanding of what has transpired is likely to create more hazards than heroes. In other words, if you are hoping to skim this book to glean a few new tricks from the examples and resettle into the easy chair of the old mindset, think twice. It would be akin to trading in a reliable workhorse like the World War II propeller-driven Spitfire for an F–18, but continuing to use inaccurate maps and a defective navigational system. You will just get to the wrong destination faster.

Corporations around the world now write checks for more than $50 billion a year in fees for "change consulting."[20] And that tab represents only a third of the overall change cost if severance costs, write-offs, and information technology purchases are included. Yet, consultants, academic surveys, and reports from the "changed" companies themselves indicate that a full 70 percent of those efforts fail. The reason? We call it *social engineering*, a contemporary variant of the machine model's cause-and-effect thinking. *Social* is coupled with *engineering* to denote that most managers today, in contrast to their nineteenth-century counterparts, recognize that people need to be brought on board. But they still go about it in a preordained fashion. Trouble arises because the "soft" stuff is really the *hard* stuff, and no one can really "engineer" it.

We will use *social engineering* repeatedly as a billboard phrase to highlight this managerial tradition. Its central premises are:

Leaders as Head, Organization as Body. Intelligence is centralized near those at the top of the organization—or those who advise them.

The Premise of Predictable Change. Implementation plans are scripted on the assumption of a reasonable degree of predictability and control during the time span of the change effort.

An Assumption of Cascading Intention. Once a course of action is determined, initiative flows from the top down. When a program is defined, it is *communicated* and *rolled out* through the ranks. Often

this includes a veneer of participation to engender buy-in.

That these familiar tenets of social engineering are not compatible with the way living systems work is probably self-evident. But, as we noted earlier, the traditional approach does have its place. The tools associated with social engineering work well when the solution is known in advance and an established repertoire exists to implement it. These conditions apply in many situations, and it is not our intent to minimize them. However, even in such straightforward applications, if employee ownership of an initiative, for example, SAP, is a prerequisite for success, regarding each person as a intelligent "node" in a living system and involving them as such, improves implementation. We don't reject all the *tools* of social engineering in all cases, but advocate the end of it as a *context*. Tools for control do not equal social engineering. What we are advocating is appropriate use of tools of the old paradigm, incorporated in a new management repertoire. Social engineering as a context is obsolete–Period.

But that is not the focus of this book. Harder to handle are those nonroutine challenges where discontinuous change is sought. These challenges often demand a leap in capability, and solutions are unproven or unknown. In these instances, nimbleness and agility are essential, and tapping the full potential of the organization as a living system becomes imperative. This is not a "maybe" or a "sort of." It's a deal breaker. Facing such an adaptive challenge, we must throw out the old notion about how a business should be led, organized, and run. We must abandon familiar organizational principle and processes and adopt strange and unfamiliar ones. The lessons of living systems provide the best map for this new territory: a mental framework for seeing order in the disorder; powerful distinctions that accelerate change; mental hooks to rely on as we scale the cliffs of the worn-out business model to reach the business model of the future. Behaving like a gardener, not thinking like a mechanic, becomes the mantra of choice.

As a general rule, adults are much more likely to act their way into a new way of thinking than to think their way into a new way of acting. Many new—and some established—enterprises, such as those discussed herein, illustrate that rule. Despite many missteps along the way, they have evolved organizations and management approaches that smack more of a beehive than a bureaucracy. And as they have enacted this new reality, they have come to think differently.

Beyond Dilbert

Is complexity science the dawning of a new age or simply grist for "Dilbert"? Will old-line "soci engineers" bolt a few showcase features of living science onto the traditional machinery, in much th same way as they compromised Total Quality Management and Self-Managed Teams? Overcomin these propensities is the quest of this book. To be sure, the old order persists. But, to quote Petzinger:

> [The] new order is poised to overtake it—haltingly in some places, unevenly in others—but inexorably in every corner of t economy and society at large. How can we be so sure the Newtonian model is giving way to the natural one? Two reasons: f one, the marketplace leaves companies no choice. In an era when change arrives without warning and threatens to eradicate ent companies and industries overnight, organizations can survive only by engaging the eyes, ears, minds and emotions of individuals and by encouraging them to act on their knowledge and beliefs. Second, and far more importantly, the new livi systems model will thrive and persist because it bears more closely to what we are as humans.[22]

To repeat, living systems isn't a metaphor. It is the way it is.

This book is an effort to ensure that a dilution of these ideas doesn't happen. The lessons of complexity are simply too important to be lost or frittered away. We have seen how they can transmute the most leaden of organizations into the gold of a flexible, fast-reacting, innovative enterprise. We believe the story of those achievements must be told, in depth, and their significance must be made clear.

In other words, we have seen the future and have wrapped it between the covers of this book.

PART ONE

CHAPTER 2

EQUILIBRIUM IS DEATH

Yellowstone, the first national park in the United States, has long been regarded as a national treasur Its 2.2 million acres (3,450 square miles) of diverse terrain and wildlife reconnects us to the va wilderness that once was North America.

But during the 1970s and 1980s, when the park's popularity brought in excess of 10 million visitors a year, the National Park Service faced a quandary: Should it continue to maintain Yellowstone as a kind of natural theme park and maximize visitor throughput? Or should priority be given to the park' ecosystem? The latter choice would impose restrictions on public access and favor the best interests nature in shaping park utilization decisions.

Under pressure, the Park Service adopted the theme-park approach and endeavored to optimize use o the park's assets by virtually programming a "wilderness experience." But complex adaptive systems have a perverse nature that defies human efforts to tame them. In 1988, the park's ecosystem demonstrated this with a vengeance when lightning ignited the largest fire in recorded North American history. Fires are common in forests. But the size and intensity of the Yellowstone conflagration were fueled by the unforeseen consequences of the programmed policies. Here's why.

For more than a century, the Park Service had maintained equilibrium in the forest by quickly extinguishing fires, denying the natural rhythm of fire and regrowth whereby forests cleanse and renew themselves.

In theory, the Park Service allowed fires to burn if they did not threaten people at campsites or hotels. In fact, because fires can so easily get out of control (and always attract bad press), they were extinguished as quickly as possible.

As a result, a thicker-than-normal layer of deadfall and debris had built up on the forest floor. The 1988 lightning strikes created multiple fires. A prolonged drought during the preceding months and ill-timed winds then conspired to incinerate the forest with intensity and velocity that are rarely witnessed in North America. The conflagration destroyed large trees and charred the living components of topsoil that would otherwise have survived. Yellowstone still bears the scars.[1]

What applies to forests applies to the business world as well. Prolonged equilibrium is a precursor of disaster, whether it happens unwittingly or, as in Yellowstone, by intent. In this chapter, we explore both accidental and deliberate sources of equilibrium. We show the dread impact of equilibrium on companies like Sears and International Business Machines Corporation (IBM).

All things in the universe—animate and inanimate—lose energy over time. Steel rusts, as painters of San Francisco's Golden Gate Bridge will testify. If the rusted steel is left unattended, it will turn into ferrous oxide dust. Living things, if not refueled by food or sunlight, perish and decay. "Ashes to ashes, dust to dust" is a poetic way of stating the Second Law of Thermodynamics.

The Law of Requisite Variety, an obscure but important law of cybernetics, states that the survival of any system depends on its capacity to *cultivate* (not just tolerate) variety in its internal structure.[2] Failure to do so will result in an inability to cope successfully with variety when it is introduced from an external source. For example, fish in a bowl can swim, breed, obtain food with minimal effort, and remain safe from predators. But, as aquarium owners know, such fish are excruciatingly sensitive to the slightest perturbations. Fish in the sea have to work much harder to sustain themselves, and they are subject to many threats. But because they cope with more variation, they are more robust when faced with change.

The lesson of Yellowstone and the imperatives of the Law of Requisite Variety make us uneasy. Equilibrium is associated with balance—a good thing, surely. Disequilibrium is balance gone haywir

Balance, or equilibrium, occurs in nature when the components of a biosystem are in sync. At the individual level, equilibrium occurs when an organism matches the requirements of its environment while meeting its own needs with the available resources. But when a fire in Yellowstone (or e-commerce in retailing) abruptly alters the stable environment, that which has remained latent (debris on the forest floor, or unmet consumer needs) can suddenly become manifest. Coping mechanisms that have atrophied during long periods of equilibrium usually prove inadequate for the new challeng Survival favors heightened adrenaline levels, wariness, and experimentation. Alfred North Whitehea got it right. "Without adventure [which we might define as disequilibrium caused by breaks with convention], civilization is in full decay."[3]

A qualification is warranted here. The extent to which prolonged equilibrium is a precursor of disaste must be assessed in the context of scale and time. At certain scales (i.e., small) and in some time frames (i.e., short), equilibrium can be a desirable condition. But over long intervals of time and on very large scales, equilibriumbecomes hazardous. Why? Because the environment in which an organism (or organization) lives is always changing. At times, it is turbulent. Prolonged equilibrium dulls an organism's senses and saps its ability to arouse itself appropriately in the face of danger.

Equilibrium by Default

Consider the dodo bird, now extinct. In its native South Pacific habitats, the dodo enjoyed a stable an congenial environment safe from predators. Lulled into a state of equilibrium during a prolonge evolutionary cycle, this docile and defenseless fifty-pound bird became incapable of flight. Abruptl it became fatally vulnerable to sailors and settlers with firearms.

The dodo was not alone. Isolated for 40 million years, the island continent of Australia fostered a stunning array of marsupials, rodents, and lizards. Many became extinct when Europeans introduced foxes, cats, goats, other mammals, and their parasites. In just 200 years, 80 percent of the biodiversit unique to Australia vanished.[4] In Hawaii, prolonged isolation gave rise to species of plants and bird life that lacked the defenses found in more diverse environments. There was no threat from indigenou browsing animals, so plants bore no toxins or thorns. Many species of birds found it more convenient to nest on the ground. After the introduction of rats, pigs, goats, and mongooses, 88 percent of Hawaii's native bird life and 10 percent of its plants disappeared.[5]

Among commercial parallels, shuttered factories in the rust belt, the victims of minimills and of agil Asian competitors, are the industrial equivalents of extinct species. They are relics of prolonged equilibrium and insufficient variety.

Life scientists call this tendency of isolated populations *genetic drift*, and it is universal among living things.[6] Unless, or until, an environmental upheaval is both real and recognized, the drift of any species is to specialize or refine its winning formula. Finches in the Galápagos Islands evolved specially curved bills to harvest the seeds of an indigenous plant. Genetic drift in organizations becomes evident when more and more energy is dedicated to tweaking a strategy that maintains the status quo.

Equilibrium by Intent

For anyone immersed in equilibrium, it is not easy to recognize it as a threat because it often wea the disguise of an advantage. It is concealed inside strong values, or a coherent and close-knit soci system, or a well-synchronized operating model.

In their best-selling book, *In Search of Excellence*, Tom Peters and Bob Waterman listed the qualitie that, in their view, contributed to the success of forty-three excellent companies.[7] Since the book's publication, managers have sought to emulate those desirable traits. Chief among them were: clear corporate vision; strong values; and a great deal of internal consistency among other elements—otherwise known as *organizational fit.* Given the authors' emphasis on the latter trait, the book may have been better named *In Search of Equilibrium.*

Within five years after the book's publication, half of the forty-three companies were in trouble. At present, all but five have fallen from grace.[8] One of this text's authors, Richard Pascale, collaborated in developing the Seven-S Framework—a management tool highlighted in the Peters and Waterman book. The Seven-S Framework identified the key levers that make organizations tick. The levers can be characterized as hard factors—strategy, structure, and systems—and softer aspects—style, staff (i.e., people), and shared values. The seventh "S" is skills. The Framework was conceived as a descriptive tool and was intended to help executives assess how each organizational component was operating with the rest.

The message was implicitly prescriptive in its support of organizational fit. As we eventually came t understand, excessive imposition of "fit" meant that it was impossible to change any single element the system without changing every other element. Unwittingly, we had actually encouraged manager to pursue the very equilibrium that would prove their undoing.

Consider IBM, which was one of the companies featured in *In Search of Excellence*. In 1993, Louis V Gerstner, Jr., the company's new chief executive officer, asked James Cannavino, a senior executive, to take a hard look at the strategic planning process. Why had IBM so badly missed the mark? Cannavino dutifully made his way through shelves of blue binders that contained 20 years' forecasts, trends, and strategic analyses.

"It all could be distilled down to one sentence," he told Gerstner. "We saw it coming. . . . Our strateg planners foresaw the impact ofPCs, open architecture, intelligence in the network, computers on microprocessors, even the higher margins of software and declining margins in hardware." Pursuing the issue further, Cannavino turned to IBM's Operating Plans. Did they reflect the shifts the strategis had projected? "These blue volumes [three times as voluminous as the strategic plans] could also be summarized in one sentence: '*Nothing changed.*'"

Cannavino added:

> But the most important piece to the puzzle was a secret only insiders would know, a dose of arsenic to our diet of cyanide, and was administered during the year-end financial reconciliation process. When we rolled up the sector submissions into totals for t corporation, the growth of new products never quite covered the gradual erosion of margins on our mainframes that was taki place. This shortfall, of course, was the tip of an iceberg that would one day upend our reliance on the IBM 360 as the centerpie of our business platform. But facing this possibility would have precipitated a great deal of turmoil and instability. Instead, ye after year, two of our most senior executives simply went behind closed doors, quantified the gap, and raised prices to cover it.[9]

■ ■

Chris Langton, one of the pioneers of complexity science, has deepened our insight into the wa equilibrium comes about. He programmed a series of simulations analogous to a beehive in whic individual virtual "bees" were given simple rules to follow. When the rules became too rigid or to numerous, the beehive froze into inactivity. A little elasticity in the rules generated a repeating patter in the hive; a few changes would ripple through the system, but the hive then reverted to its origin state and the same pattern emerged again and again. In both instances, the rules evoked order an equilibrium.

With no rules, the opposite phenomenon occurred. The hive dispersed. But there was yet another set rules described by arcane, hard-to-pigeonhole algorithms that proved most interesting. Along with some regularity, there was a flow of nonrepeating patterns. The algorithm was defined in such a way that it generated disturbances in its own regularity. Patterns would propagate in the honeycomb, disaggregate, and then recombine in perpetually novel ways. The "hive" always had enough internal variety to keep it from being locked into itself.[10]

Let's look at Japan in the beehive context. In 1998, the nation of Japan experienced banking losses equivalent to 60 percent of its gross domestic product (GDP).[11] But, as with Langton's rigid rules for most of the 1990s, Japan's culture and institutions steadfastly resisted altering the parameters that might have fostered the disequilibrium necessary to reset the economy on a more vibrant footing. As

heavily networked society, Japan's version of Langton's rules was:

Redundant workers must not be laid off.

Government should shore up failing companies with public works spending.

Banks should carry an inflated value of loans on their books rather than taking write-downs.

Banks should never allow a business to fail by forcing nonperforming borrowers into insolvency a passing the losses on to investors.

The rules limited the network's flexibility. When a national or corporate culture such as Japan's (or IBM's) is "so thick you can cut it with a knife," all those dense connections fuse like chemical bonds rather than flexing like a permeable network.

Neither IBM nor Japan failed to respond effectively to an equilibrium threat because of indifference, laziness, or inefficiency. Rather, these systems did not recognize an equilibrium threat. It is difficult to do so when one is immersed in equilibrium, and harder still to arouse oneself to the proper level o response. A fish takes for granted the water in which it swims; when it learns about land, it is usually too late. When a long period of stability lulls a company into equilibrium, that condition is tantamou to a death sentence.

So why don't all living systems spiral into the thrall of equilibrium and die? Because two countervailing forces are at work to promote instability and thwart equilibrium. One is the threat of death through the eternal Darwinian struggle for survival; the other is the promise of sex, by which w mean recombinations that introduce genetic diversity. Let's take a look at each.

The Threat of Death

In 1839, when Charles Darwin set forth from England aboard the *H.M.S. Beagle* to study t ecological system of the Galápagos Islands off the coast of Ecuador, he expected to find a stabl natural community living at peace with itself in an isolated habitat. Instead, he encountered turmo and relentless imbalance as species encroached on one another.[12] Darwin summarized these surprisi discoveries in the last chapter of *The Origin of Species:*

> In looking at nature, it is most necessary never . . . to forget that every single organic being around us may be said to be striving the utmost to increase in numbers; that each lives by a struggle at some period of its life; that heavy destruction inevitably falls many. The face of nature may be compared to a yielding surface, with 10,000 sharp wedges packed close together and driv inwards by incessant blows, sometimes one wedge being struck, and then another with greater force.[13]

One of Darwin's most important contributions was his observation that species (by which we mean living systems) do not evolve of their own accord. Rather, they change because of the forces—indeed the threats—imposed on them from the environment. Having said that, it should also be pointed out that many species seek avenues of survival that do not escalate into full-blown life-or-death struggles with others. Most species seek means to cooperate, coevolve, and coexist. Even within species, one finds many examples of altruistic behavior. Among mammals and insects, individuals regularly sacrifice themselves for the good of the whole.[14]

Life scientists call these dynamics of survival “selection pressures.” Selection pressures intensify during periods of radical upheaval. Most species, when challenged to adapt too far from their origins are unable to do so and disappear. But nature is a fertile and indifferent mother, more dedicated to proliferating life in general than to the perpetuation of any particular species. From the vantage point of the larger complex adaptive system, selection pressures constantly enforce an ecological upgrade. The mutations that survive fit better in the new environment.

Reflecting on the competitive corporate landscape of the past decade or two, we can readily identify with Darwin’s wedge imagery. New rivals are constantly converging on the same market opportunity and they clamber relentlessly over one another, seeking a better position in the economic food chain.

Whole sectors decline or disappear entirely. Office-supply stores are swept away by Staples, and the largest and most established bookseller, Barnes & Noble, is badly shaken by Amazon.com. The examples speak to the ubiquity of selection pressures as they play out on the corporate landscape. There are no safe havens. From cell phones to cotton seeds, pharmaceuticals to payroll systems, herbicides to hot sauce, soap to software, it is a Darwinian jungle out there, and it isn’t getting easier

Like all complex adaptive systems, corporations must be ready for a sudden confrontation with the inexorable hazards of natural selection. Widely admired leaders such as General Electric’s Jack Welc have devised ingenious techniques for sounding the Darwinian call to arms. It is interesting to analyz GE’s well-publicized methods from the disequilibrium perspective. In 1980, when he succeeded Reginald Jones, a popular and highly respected CEO, Welch found GE’s many businesses too comfortable in their oligopolistic markets. “I wish I did not have to play the hand I was dealt,” he confided to Richard Pascale, who worked with him extensively in the early 1980s. “Yes, these businesses are generating reliable earnings,” he worried, “but they lack a competitive edge.”[15] To shake this complacency, Welch announced that every business must be number one or two in its industry or it would be divested, and he proved true to his word. Flagship brands such as GE’s Small Appliances, Mobile Communications, and Factory Automation were put on the block. Throughout thi huge corporation, one could feel a rush of adrenaline.

Next in Welch’s arsenal of disequilibrium-generating devices was “Workout.” Characterizing GE as “an overweight slugger up against nimble street fighters,”[16] Welch unleashed a process through whic lower-level employees could shine the spotlight of public scrutiny on the most aggravating bureaucratic policies and redundant work practices. Workout (which might be thought of as “Theater for Disequilibrium”) fostered a series of public events at which senior corporate officers were subjected to straight feedback from the troops. Then, under continuing employee oversight, they were expected to take decisive action in eliminating hindrances. Following Workout, Welch turned his attention to the pace of change. In 1992, he launched the Change Acceleration Process in which the to 100 executives in every business were trained to be change agents and were then given an essential business project designed to both internalize and demonstrate their skills. “When change within a business is slower than that without,” Welch observed, “you’re in real trouble. We can’t predict the future but we can learn to react a lot faster than our adversaries.”[17] Sound familiar? Welch provided u with a down-to-earth restatement of the Law of Requisite Variety.

Most recently, Welch’s emphasis has been on Quality—not a new idea, to be sure, but implemented i half the time normally required for a company-wide program and aspiring toward exacting outcomes Each of GE’s initiatives shares a pattern: Amplify survival threats and foster disequilibrium to evoke

fresh ideas and innovative responses.

The Promise of Sex

Complex adaptive systems become more vulnerable as they become more homogeneous. To thwa homogeneity, nature relies on the rich structural recombinations triggered by sexual reproduction. Se is decisively superior to evolution's other major alternative for species replication: parthenogenesis.

Parthenogenesis (the process by which some plants and worms conceive offspring through self-induced combinations of identical genetic material) yields offspring identical to their single parent. That process is of little help when a species desperately needs a novel mutation to stave off disaster.[1

Sexual reproduction maximizes diversity. Chromosome combinations are randomly matched in variant pairings, thereby generating more permutations and variety in offspring. Oxford's evolutionary theorist, William Hamilton, offers a simple explanation of why this benefits a living system.[19] Enemies (such as harmful diseases and parasites) find it harder to breach the diverse defenses of a population generated by sexual reproduction than the relatively uniform defenses effected by parthenogenesis. By mingling genes, males and females arm their offspring with novel DNA combinations. Microbes equipped to pick the locks of one generation of a particular species discover that the cellular tumblers have been changed in the next. When the bubonic plague swept through Europe in the fourteenth century, it decimated 30 percent of the population. Subsequent wav of the deadly contagion claimed only a fraction of that number.[20] Sexual reproduction had distributed protective antibodies to most of the progeny of the first wave's survivors. The majority of the next generation's population was protected when the bacteria returned for an encore.

At the London School of Economics, Alex Trisoglio has studied the connection between disease and genetic diversity. He observes:

> Recent study of evolution, both in the natural world and in computer-based complex systems, has demonstrated the surprisi result that the presence of parasites in a system accelerates evolution dramatically. A parasite will find a way to take advantage of host; the host will evolve a way to protect itself; the parasite, in turn, will find a new line of attack. In such "evolutionary ar races" the ability to change more rapidly than the other organism is truly the only sustainable competitive advantage. Recent wo suggests that this Red Queen effect, which is named after the character in *Alice in Wonderland* who runs as fast as she can just stay in the same place, may even be responsible for the evolution of sex itself![21]

When Jack Welch challenges each GE business head to (1) hire 30 to 60 people with e-commerce or other nontraditional backgrounds, (2) protect them from the organization's immune defense response and (3) come up with viable "Destroy-Your-Business.com" options within six to nine months, he is fostering precisely the kind of arms race between a parasite and host that Trisoglio describes.[22]

Along with the unique advantages it bestows, sexual reproduction introduces a significant drawback: It dilutes a winning formula. Because the genetic cards are always being shuffled, successful parents cannot ensure that their winning talents will be inherited by their progeny. As the breeders of racehorses know all too well, mating the filly that won the Preakness with the stallion that swept the Kentucky Derby does not guarantee an offspring that will win the Triple Crown.

Human Intention and Change

In the natural world, the dichotomy between genetic uniformity, which perpetuates a winning formul and genetic diversity, which dilutes the formula, is resolved by evolution and chance. In the busine world, it's an important matter of choice.

This trade-off also represents an excruciating paradox. Companies must weigh the benefits of introducing new genetic material—say, in the form of new hires—against the possibly disruptive effects on a smoothly running operation.

It is critical to protect the reliable core of an organization's business platform while one simultaneously plants and nurtures the seeds of revolutionary change. One way to do this is to carefully cultivate the fringes. Here we adopt another process from nature. The "verge"—the bounda between forest and savanna, or the intertidal zone along the ocean's edge where no single species dominates—is known to foster the most prolific rate of mutation. Alex Trisoglio states:

> The fringes are the source of most truly innovative ideas in cultures, economies and organizations. By promoting an active fring which may appear uneconomic or positively anti-systemic, an organization can ensure that it is continually testing for new ide and possibilities. The management challenge is that much fringe activity will create no value at all, whereas the occasional idea c revolutionize the company. As a result, assessing cost-effectiveness for fringe activity in general can prove difficult. A secon problem is recognizing when the fringe has created something so important that it no longer deserves to be on the fringe.[23]

Xerox PARC (Palo Alto Research Center) is a case in point. The Xerox R&D lab invented ALTO (which many regard as the first personal computer), the first commercial mouse, Ethernet (predecessor of the Internet), many of the basic protocols of the Internet, client-server architecture, laser printing, and flat-panel displays, to name a few of its numerous contributions.[24] Yet because the rest of the mainstream organizations did not recognize (and would not embrace) the revolution at the fringe, Xerox was left in the backwater of the major new wealth-creating opportunities of the past thirty years. This legacy will surely one day warrant a place in the corporate hall of shame.

Every molecule in the human body replaces itself every seven years.[25] What endures are the genetic instructions that direct new cells to sustain the physical presence. Just as the body's molecules replenish themselves by moving in and out of the system, so must an organization revitalize itself by utilizing new members and diverse ideas. Both human and corporate bodies are rejuvenated by fresh and varied genetic material.

Exchanges of DNA within social systems are unfortunately not nearly as reliable as those driven by the mechanics of reproductive biology. True, organizations can hire from the outside, bring senior officers into frequent contact with iconoclasts from the ranks, or require engineers and designers to meet with disgruntled customers so the former can learn from the latter. But the enemy of these mechanisms for exchanging metaphoric DNA is, of course, the existing social order. Like the body's immune defense system, the social order identifies foreign influences and seeks to neutralize them.

Equilibrium enforcers—persistent social norms, corporate values, and orthodox beliefs about the business—often nullify the sought-after advantages of diversity. An executive team may recruit an outsider to gain diversity, then regress into behavior that nullifies the advantage by listening stereotypically ("There goes the techie again," "Ah—the feminist point of view"). The new token "genetic material" often finds itself frozen out of important informal discussions in which the real business gets done.

Of the six companies forming the cornerstone studies of this book, Sears most powerfully exemplifie these dangers. Almost all employees of Sears began their careers as teenagers working as stock clerk or sales personnel. They left for college or stints in the armed services, then rejoined the company to climb the management ladder. The average length of service of the 5,000 top managers is twenty yea —the outgrowth of a conscious policy to hire at entry level and promote exclusively from within. When Arthur Martinez took over in 1992, he was the first chairman in 110 years to come from outsid Sears, and only one of his top 100 executives was an external hire.[26]

Sears provides a stark contrast to the design for diversity one finds in Silicon Valley. Job swapping is the norm, not the exception. (It is perhaps the only region on earth where one can change companies without changing car pools.) The valley behaves like a "company," and the companies located in the valley are like "divisions." In its entirety, it is a superorganism; ideas, employees, capital, and technology flow rapidly within the system. This activity is not without its costs, but the turmoil contributes to the region's intellectual and economic vibrancy.

When management thinker Gary Hamel was asked whether he thought IBM had a chance of leading the next stage of the information revolution, he answered: "I'd need to know how many of IBM's top 100 executives had grown up on the West Coast of America where the future of the computer industr is being created, and how many were under forty years of age. If a quarter or a third of the senior group were both under forty and possessed a West Coast perspective, IBM has a chance."[27]

Chance or Choice?

Conscious learning and intention define a watershed in our exploration of what the science complexity means for business—a line of divergence between humans and the rest of nature. Natu disturbs equilibrium through the threat of death and the promise of sex; it nudges species into an are where chance mutations can thrive. Clear parallels exist between human systems in general an businesses in particular. But humans have an important advantage. As self-knowing and intellige entities, companies, at least in theory, are capable of recognizing danger (or opportunity) in advanc and mobilizing to take appropriate action. They can wield the power of human intention.

The role of human learning and intention in evolution reignites a debate that had, for the most part, been laid to rest by Charles Darwin. In the early nineteenth century, French zoologist Jean Baptiste Lamarck studied biological adaptation. His work, a precursor to Darwin's, argued that species proactively caused their own *genetic* evolutionary change. Lamarck concluded that species exhibit an inherent tendency to evolve more complex strategies for survival over time. (This much was subsequently shown to be correct.) Lamarck's more controversial assertion was that species do so through the *genetic* transfer of *both* physical traits and *learning* to their offspring[28]—an assertion tha was discredited by Darwin's discoveries. Evolved mammals exhibit intentionality and transfer experience to their young, but this is not captured genetically nor is it bestowed automatically on the next generation. "Evolution through learning" anthropomorphizes what is better explained by random mutation and natural selection.

Human beings are extremely well equipped with consciousness and the capacity of foresight. To a greater extent than other species, they *can* lift themselves by their anticipatory bootstraps. But the biggest difference, of great significance to business, is that human learning is codified and can be passed down, via the social system, to future generations. In this sense, learning becomes part of the "genetic" structure. Lamarck may have been wrong about species, including humans, at the individua

level, but he was right insofar as human social systems not only learn behaviors but incorporate them into their cultural DNA.

All this can become a blessing or a curse. Human systems are capable of discontinuous leaps in learning that would have been regarded as unimaginable, given the previous institutional trajectory. This was certainly the case at Monsanto and in the transformation of the U.S. Army. Within these institutions, learning was incorporated into the skill base of future generations. Sears exemplifies how resistant the old DNA can be to the infusion of new genetic material.

The above discussion might lead us, in balance, to an optimistic prognosis for humanity in general and organizations in particular. In theory, humans are endowed with conscious awareness. They are capable of intellectually grasping a threat before it materializes and, through the exercise of intention, responding it before it is too late. Finally, as we have discussed, human systems can incorporate these valuable lessons into the DNA of the organizational memory—at least in theory. In reality, the actual track records of many business organizations give cause to ponder. History seems to better support Winston Churchill's apt observation that "mankind will occasionally stumble over the truth, but usually we pick ourselves up and carry on."[29]

Our collective failure to translate conscious awareness into effective organizational response is captured in the declining survival rate of the Fortune 500 over the past twenty-five years. During the relatively tranquil period from 1976 to 1985, only 10 percent of those listed fell by the wayside (they failed to grow as rapidly as their peer group, merged or were acquired, or, in a small fraction of cases, went bankrupt). Skip to the more turbulent period from 1986 to 1990, when the attrition rate jumped to 30 percent. In the next five years, 1991 to 1996, the attrition rate rose again, this time to 36 percent.[30] It is reasonable to assume that most companies on the Fortune 500 list (1) would have preferred to remain there (e.g., organizations that were acquired would have preferred to have been the acquirers) and (2) were aware of the competitive threats in time to take corrective action. The question becomes: Why didn't they do so? Truer to Darwin's theories than we would wish, learning and proactive response did not take place. A significant percentage of organizations failed to mobilize the level of response needed to sustain themselves.

Now consider this stark contrast. Over the past 100 years, the health sciences have almost doubled human longevity in the industrialized world whereas corporate longevity has actually decreased. Even if we exclude the large subset of companies that perish before completing their first five years in business, the average corporation lives only half as long as the average human being![31]

The lessons of nature and the specific principles of living systems do not constitute a miracle drug that cures all these ills. But when an organization needs to fundamentally reinvent itself and sustain high levels of responsiveness and agility, the insights of living systems allow us to see more deeply into the challenge and provide more promising avenues for success.

As we will witness at Hewlett-Packard, Monsanto, Shell, and the U.S. Army, the principles of complexity can be translated into practical designs for the purpose of revitalizing organizations. That statement isn't a metaphor. It isn't speculative. It isn't astrophysics. Readers may even be familiar with many of the techniques employed, but the above applications had distinctly encouraging results. In another realm, many of the herbal remedies used centuries ago are finding their way into modern pharmaceuticals. The active compounds remain constant, but the forms and potency are vastly improved. A systemic understanding of bacteria, viruses, body chemistry, and genetic structure (which

enables scientists to identify trace ingredients, replicate them, and intensify their potency) was needed to achieve the inroads against disease that have taken place. The principles of complexity provide a similar means of tapping the active ingredients of familiar management techniques and making them much more powerful.

The practical means of applying the principles of complexity are at hand. Resistance to implementation is found less in the workforce than among executives and managers. Opposition is anchored in the assumptions of social engineering and the machine metaphor, which, as discussed in Chapter 1, deny that organizations are living systems and withhold some of their most potent means mobilizing their resources and sustaining their vitality.

When a roadway exists and one wishes to transport a load, harnessing a horse to a cart makes a great deal of sense. In a condition of greater uncertainty, such as a horse race, jockeys typically relinquish more initiative to their horses in the final stretch. And when they become lost on an unfamiliar mountain trail after dark, wise riders simply give their horse its head. In each case, the horse is a living entity. Conditions determine the optimal degree of freedom given to this living entity and, in particular, the extent to which tapping into the full potential of the horse's native intelligence is desirable.

Organizations are very much alive, however we choose to manage them. Whether we approach them with a script defined by social engineering (that is, consistent with the traditional machine model) or regard them as living systems will depend on the circumstances we encounter. Specific criteria will help us to evaluate the situation and determine the type of leadership required.

Human Intention and Adaptive Leadership

The six organizations that form the cornerstones of this work—British Petroleum, Hewlett-Packard, Monsanto, Sears, Shell, and the U.S. Army—differed radically in the immediacy of the threats they were facing, yet all were mobilized by a defining act of human intention. Conventionally, we refer to this as "leadership." Yet, curiously, the six corporate leaders shared almost no personal traits in common:

John Browne, Managing Director (at the time of the case), British Petroleum's Oil Exploration Unit (cerebral and instrumental);

Joel Birnbaum, Senior Vice President and Director of Hewlett-Packard Laboratories (visionary warrior);

Robert Shapiro, CEO of Monsanto (professorial and conflict-averse);

Arthur Martinez, CEO of Sears (analytical and abrupt);

Steve Miller, Managing Director of Oil Products at Shell (approachable and consensus-oriented);

General Gordon Sullivan of the U.S. Army (charismatic and deeply inquisitive).

None of these men led in a conventional fashion. Each unleashed his organization's *distributed* intelligence. All but Martinez and Browne came fully to terms with their organizations as living systems.

Ronald Heifetz, Director of the Leadership Education Project at Harvard's John F. Kennedy School of

Government, observes that leadership is frequently equated with authority.[32] This is misleading. A great many people in authority do not provide leadership; conversely, some people who had very little formal authority have changed the world through extraordinary acts of informal leadership. Jesus Christ, Buddha, Mohammed, Mohandas Gandhi, Martin Luther King, Jr., Mohammad Yunas, Nelson Mandela, and Susan B. Anthony come to mind.

Heifetz makes a distinction between "technical (i.e., operational) leadership" and "adaptive leadership."[33] The former entails the exercise of authority and is an entirely appropriate response in conditions of relative equilibrium. Operational leadership works best when the problems faced can be dealt with by drawing upon a preexisting repertoire and exploiting it with more speed, quality, or scale. Operational leadership goes hand in hand with the tenets of social engineering. A solution is devised from above and rolled out through the ranks. If a company is in crisis; if downsizing, restructuring, or reducing costs is called for; if sharpened execution is the key to success, then operational leadership is the best bet.

Most business situations, of course, are rarely either/or propositions. Often, businesses face operational and adaptive challenges simultaneously. Even when the organization at large is in the midst of a full-blown transformation, there are usually pockets of activity where conventional management practices work best. At Sears, transformation was necessary in frontline service delivery in the mall stores. But the highly profitable Sears credit card division was not facing such radical change in its segment and was appropriately managed in a traditional manner. The U.S. Army sought transformation in combat methods (using information technology to improvise on the battlefield). For the most part, its other mainstream activities—procurement, logistics (The U.S. Army Matériel Command), and the conduct of basic training (i.e., boot camp)—proceeded along conventional lines, unscathed by the turmoil elsewhere.

The point is: Over time (and even concurrently), organizations need evolution *and* revolution. When they have been limited exclusively to the restrictive precepts of social engineering, they have been handicapped and largely unsuccessful in unleashing authentic revolutionary change. The principles of living systems offer a powerful new recourse. The trick is to clearly identify the nature of the challenge and then use the right tool for the right task.

Making Happen What Wouldn't Happen Otherwise

As we have noted, living systems usually respond to disequilibrium threats by attempting to restore stability. In a leadership context, employees rely on those in authority to orchestrate a response (usually drawn from a routine that has previously been proven successful). If the traditional repertoire is appropriate for the present challenge, the organization copes successfully. The system resides secure in the knowledge that it is doing more of what it already knows how to do.

Problems arise, however, when a species (or organization) misapplies a traditional solution to an *adaptive* problem. In this situation, the current repertoire of solutions is inadequate or just plain wrong. In nature, the alpha male silverback mountain gorilla draws its troop together in a tight circle and behaves aggressively toward rival males or other natural threats. This traditional solution works effectively—unless the troop is facing poachers armed with guns, tranquilizer darts, and capture nets.

Adaptive leadership "makes happen what isn't going to happen otherwise." It is a surefire recipe to disturb equilibrium. Consider a problem for which traditional solutions are unsuitable and a novel

solution must be found. An example might be Barnes & Noble's threat from Amazon.com or Native American tribes' loss of hunting grounds to the encroachment of Caucasian settlers. What is predictable in these situations? The individuals affected will look to figures of authority. More often than not, those in charge take the bait, try to provide the answers (drawn from traditional success routines), divert attention to easier problems, or tread water—all the while allowing the initial threat to intensify. In the 1930s, a weary British public, still exhausted after World War I, looked to Prime Minister Neville Chamberlain to find a way to stop Hitler without involving England in another war. Britain had no appetite for rearmament.

Chamberlain played his part, seeking to maintain equilibrium in the British social system through a policy of appeasement. He signed the Munich Treaty, acceding to the German occupation of Czechoslovakia. The long period of appeasement did not end until Hitler's invasion of Poland. By then, the German war machine was ready to take on the world. Initially, Chamberlain gained authorit by taking the problem off the shoulders of the British people and carrying it for them. His prompt los of authority when this solution failed is the other side of the quid pro quo.[34]

Leaders are to a social system what a properly shaped lens is to light. They focus intention and do so for better or worse. If adaptive *intention* is required, the social system must be disturbed in a profoun and prolonged fashion. Magnifying a threat or utilizing organizational devices to propagate "genetic diversity" then becomes important. Adaptive leaders don't move on an issue too quickly or reach for quick fix. Rather (taking actions quite the opposite of social engineering), they emphasize mobilizing followers deep within the ranks to help find the way forward. This is achieved, as Heifetz describes i by (1) communicating the urgency of the adaptive challenge (i.e., the threat of death), (2) establishin a broad understanding of the circumstances creating the problem, to clarify why traditional solutions won't work (i.e., sustaining disequilibrium), and (3) holding the stress in play until guerrilla leaders come forward with solutions (i.e., making room for genetic diversity). This sequence generates anxiety and tension.[35]

Adaptive leaders can be frozen out when followers don't want to face the bad news (e.g., Churchill's warnings to the British public about Hitler prior to World War II). Churchill was written off as a haw and an eccentric for five long years as Hitler rearmed Germany, pursued technological advances in airplanes and submarines, and otherwise mobilized an increasingly militant German nation.[36]

Followers often turn to authority as a bulwark against the associated uncertainty and risk. "The essential work of adaptive leadership is to resist these appeals," states Ronald Heifetz. "Instead, they must (1) hold the collective feet to the fire, (2) regulate distress such that the system is drawn out of its comfort zone (yet contain stress so it does not become dysfunctional), and (3) manage avoidance mechanisms that inevitably surface (such as scapegoating, looking to authority for the answer and so forth)."[37]

The concept of adaptive leadership, necessary when an organization is challenged to do what it has never done before, sheds considerable light on the organizations discussed in this book. As we proceed, the distinction between *adaptive* and *operational* leadership will be a recurrent theme.

Disturbing equilibrium through the mobilization of adaptive intention is an unnatural act, especially for executives who have risen through the ranks and have been rewarded for their competence in exercising authority. The big payoff of the living systems point of view is that what is remote and unnatural within the traditional frame of reference becomes sensible and accessible within the