

THE EVOLUTIONARY FIRM AND ITS MORAL (DIS)CONTENTS

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Abstract: The business firm, called here the Evolutionary Firm, is shown to be a phenomenon of nature. The firm's motives, organization, productivity, strategy, and moral significance are a direct outgrowth of natural evolution. Its managers, directors, and employees are natural agents enacting and responding to biological, physical, and ecological impulses inherited over evolutionary time from ancient human ancestors. The Evolutionary Firm's moral posture is a function of its economizing success, competitive drive, quest for market dominance, social contracting skills, and the neural algorithms found in the minds of its executives and directing managers. Behavioral, organizational, and societal contradictions arise from the normal expression of these nature-based executive impulses, so that the business corporation cannot simultaneously satisfy society's moral expectations and perform its nature-dictated economic functions.

Introduction and Overview

This paper outlines a concept of the Evolutionary Firm and its moral significance. The business firm, to be called the Evolutionary Firm (EF), is shown to be a phenomenon of nature. This is tantamount to saying that the business firm's motives, productivity, organization, strategy, markets, and its moral significance are a function of—a direct outgrowth of—evolutionary natural forces. The people who work within the Evolutionary Firm—owners, managers, employees—are themselves natural agents responding to a variety of biological, physical, and ecological impulses that were laid down in the genetic substrate, inherited from human ancestors over long periods of evolutionary time, elaborated through successive generations of the *Homo* genus, and channeled to various ends and purposes by human culture. Their decisions and policies are molded, sometimes haphazardly, other times effectively, by complex environmental natural forces over which they exert little or no direct rational control but which require highly attuned pragmatic skills. The normative significance of the EF—its moral deficits and credits—is understood only after peeling back the successive organizational and behavioral strata laid down through evolutionary time to reveal the values, ethics, and moral precepts left standing by natural selection.¹

The Evolutionary Firm: An Overview

All business firms—large or small, domestically sheltered or globally exposed, giant corporation or neighborhood proprietor, prospector for minerals or producer of complex software, hawker of goods or service provider—are Evolutionary Firms. They are made so by responding to insistent, unyielding pressures of nature that impel them to be what they are and to do what they do. Natural selection has implanted motives deep within the firm's core structure, has given it the gift of creativity and productivity, has laid down organizational pathways, has enabled it to maneuver (though perilously) across competitive landscapes, and, *mirabile dictu*, has imbued it with a troubling, vexatious moral impulse.

Figure 1

THE EVOLUTIONARY FIRM'S FIVE CORE FUNCTIONS

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| MOTIVATOR/DRIVER The central motive of business operations |
| INNOVATOR/GENERATOR The source of innovation and productivity |
| ORGANIZER/COORDINATOR The firm's organizational systems |
| ENABLER/STRATEGIZER Strategic management to achieve business goals |
| MORALIZER/VALUATOR Moral impulses operative within the firm |

The Evolutionary Firm therefore displays five principal operations and core functions (see Figure 1). The Motivator/Driver function and the Moralizer/Valuator function will be emphasized in this account, the former because it conditions all other activities and features of the EF, the latter because it expresses the EF's moral stature. The other three functions—Innovator-Generator, Organizer-Coordinator, and Enabler-Strategizer, especially their bearing upon the firm's moral status—are discussed briefly later in the paper.

Lying behind, supporting, and activating each of these five functions are distinctive, identifiable natural processes that enable the firm to operate as an entity and to carry out its distinctive role in human society (see Figure 2, p. 148):

Thermodynamics defines and sustains the principal business motive of economizing.

Symbolic cerebral codes and programs drive business productivity and innovation.

Two natural components—*symbolic language networks* and *coercive power systems*—make up the firm’s organizational architecture.

Complex ecosystem dynamics dictate the firm’s search for a sustainable strategy.

Embedded neural algorithms (the brain’s “hard-wiring”) activate conflicting moral impulses within the firm.

To anticipate much of what is to follow, the paper’s central thesis can be put this way: *The confluence and contradictions among these underlying natural forces produce the distinctive, peculiar moral proclivities and ethical dilemmas of the Evolutionary Firm.*

Two Theoretical Puzzles

Before going on to describe how the Motivator-Driver shapes the actions and policies of the business firm, a precautionary note is in order. The concept of the Evolutionary Firm being proposed here rests on two very basic premises which must be proven or demonstrated if the concept is to be valid. Each can be put in the form of a question.

Is the Evolutionary Firm subject to natural selection? We know that *organisms* evolve through a combination of genetic transmission, genetic mixing, random mutations, and natural accidents and events, all occurring as the organism interacts with its environment. Those traits that promote an organism’s reproduction and gene replication are selected for over evolutionary time. Can a similar kind of organic process exert influence on business firms, shaping their form and function? If so, what are the organic components on which natural selection works? Are they the people, i.e., the human organisms, who are identified with the firm? If they are in fact the firm’s organic constituents, does natural selection operate on them as *individuals*, or as *a coalition* of organisms? This is a question that has long dogged Darwinian theorists: what unit of life does natural selection work on: Genes? Individuals? Groups? (Wright 1994: 186–188; Dennett 1995: 320–331; Ridley 1996: 175–188)

This puzzle is equivalent to asking whether the firm exists apart from the participants in it. Can “the firm,” as opposed to the people in it, be seen, or heard, or touched? Does “it” move around, do things, interact with “its” environment? Is “it” born? Does “it” die? Is “it” alive in an organic sense? If it is none of these things, then how can it be said to be organic and thus subject to natural selection pressures? The firm’s individual organic people display these traits, but can the same be said for the firm when it is considered as an entity *sui generis*? What is the evolutionary “it-ness” of a business firm? What is genetic or organic about the firm?

The position throughout the remainder of this paper is that the firm has organic (and nonorganic) parts but is not itself organic or genic. The firm’s organic core is a coalition—an alliance, a collective, a team—of biological

Figure 2
THE EVOLUTIONARY FIRM'S NATURAL SUBSTRATE

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|---|---|---|--|--|
| <p>MOTIVATOR/ DRIVER</p> <p>← Becomes</p> <p>↓</p> <p>Economizing, Entropy Avoidance</p> | <p>INNOVATOR/ GENERATOR</p> <p>← Becomes</p> <p>↓</p> <p>Cognitive, Calculative, Innovative Output</p> | <p>ORGANIZER/ COORDINATOR</p> <p>← Becomes</p> <p>↓</p> <p>Focused Managerial Power and Controlled Linguistic Networks</p> | <p>ENABLER/ STRATEGIZER</p> <p>← Becomes</p> <p>↓</p> <p>Competitive Market Strategy and External Relations</p> | <p>MORALIZER/ VALUATOR</p> <p>← Becomes</p> <p>↓</p> <p>Values Hierarchy: • Economizing • Moralizing • Emotive Driver</p> |
| <p>← Induce ↓</p> | | | | |
| <p>-----</p> | | | | |
| <p><i>THERMODYNAMIC ENERGY FLOWS</i></p> | | | | |
| <p><i>GENERATION OF SYMBOLS/IMAGES/ CEREBRAL CODES</i></p> | | | | |
| <p><i>THE NATURAL SUBSTRATE</i></p> | | | | |
| <p><i>POWER-DOMINANCE IMPULSE/LANGUAGE FACILITY</i></p> | | | | |
| <p><i>ECOSYSTEM DYNAMICS/ECOLOGICAL LINKAGES</i></p> | | | | |
| <p><i>ANCESTRAL NEURAL ALGORITHMS</i></p> | | | | |

agents (i.e., people) who act collectively and symbolically as an adaptive unit, displaying a suite of organic behaviors and interacting with environment as do all organisms, and is thus subject to selection. The human members of the coalition include owners, directors, managers, employees, consultants, and others who enable the firm to do its work. In most firms, especially the larger ones, multiple coalitions exist, often with overlapping memberships; ideally, they cooperate in pursuing the firm's goals but frequently compete with each other. As biological agents acting in behalf of the firm, these human (organic) coalitions are subject to natural selection pressures. More will be said about the adaptive behavior of these coalitions later on.

The second major theoretical issue to be resolved concerns the moral traits of the Evolutionary Firm. *Can the values and moral principles operative in the Evolutionary Firm be a product of nature?* More generally, is morality, or a moral potential, implicit in nature and evolution? On what grounds can it be said that what humans now call "morality" is only another manifestation of evolutionary processes operating over long time spans?

It is well established that a wide range of biological organisms, including humans, engage in behaviors that display moral potential (Ridley 1996; Flack and de Waal 2000). Reciprocated altruistic acts, support of close kin, agreements among strangers to cooperate in social exchange, symbiotic linkages among cooperating organisms—all of these fall within the meaning given by humans to "moral" behavior. That the individual organic agents who populate the business firm are capable of engaging in such normatively tinged activities cannot be doubted. Can the same thing be said of the coalition of biological agents (owners, managers, employees, et al.) who inhabit the Evolutionary Firm? Are the moral-like effects generated between *individuals* also reproduced within the *coalitional* behavior of the biological agents who make up the firm? If so, is there an emergent quality of the firm's behavior that is simultaneously a function of natural processes and recognizable as morality?

If this were so, it would not be equivalent to saying that nature defines morality or that it is itself moral. Moral value (and its converse) is a human conceptual invention, an assigned quality, made possible by human judgment, which is itself a natural process. Morality is not *in* nature but emerges from judgments about natural processes that affect human welfare.² At the same time, the judgments that *are* morality are themselves a function of identifiable natural forces—in this case, the brain's cognitive and emotive capabilities—that make such judgments possible. Morality is in this sense a reflexive relationship between natural process and human judgment. This moral reflexivity recognizes no impenetrable boundary separating moral judgment from nature and is neither hampered nor restrained by such an imagined barrier. Human moral judgment, being a function of nature, is easily at home with its procreator.

The argument here will be that evolutionary change produces biologically adaptive (and maladaptive) behaviors whose consequences are judged by humans to be either moral or immoral. Beyond and in addition to these moral

proclivities associated directly with organic adaptation are the many ethical themes generated by human experience as lived in highly diverse sociocultural settings. However, these cultural themes, too, are subject to a natural evolutionary calculus, to be briefly noted later on.

The Firm's Motivator/Driver Function

Outwitting Entropy through Economizing

The primary natural force responsible for business motives is found within the operation of thermodynamic laws. These physical processes set the basic conditions under which all living organisms exist and sustain themselves over time. Put as simply as possible, all life entities must acquire and process sufficient energy to begin life, build their basic cellular structure, and develop whatever growth potential is present in their genetic makeup. By capturing energy and incorporating it within themselves, living beings are responding to what physicists call the first and second laws of thermodynamics (Coveney and Highfield 1990; Goldstein and Goldstein 1993; Haynie 2001).

The first law says that the total amount of energy present in any closed system remains constant through time, thereby leaving it to the organism's skill and ability to capture enough energy for its purposes. The classic statement of thermodynamics laws, developed during the nineteenth century, posits a closed system containing a constant amount of energy. As will be subsequently explained and argued, this stricture is relaxed in the present account, inasmuch as few of the life units and their ecosystems to be discussed, including the business firm, are closed but are instead open to their respective environments. This openness becomes a key element in their survival, enabling them to import and export energy.

The second law says that the use of energy always converts it into some less useful form. The tendency of energy to be degraded until it is no longer available to do work is called *entropy*. All life entities, including the business firm, are driven to find and use energy.³ In doing so, they produce entropy in the form of degraded energy, wastes, and pollution. Within the living space firms occupy, their constant need is to absorb energy, using it to build and maintain an organizational structure, and letting the energy drive the firm onward, striving to stay ahead of the entropy wave that they themselves are helping to create. Entropy constantly bears down upon all living entities. Evading or avoiding or postponing it is essential.⁴

The search for energy to exceed entropy and for organizational order to repel disorder and dissolution is ceaseless in the life of the Evolutionary Firm because entropy carries the danger of increasing faster than the firm can absorb energy to do its work. This means that a business firm can be overwhelmed by entropy—*unless it can export its entropy into the surrounding environment*. In that case, it can be someone else's problem. The greater the order created in the firm to promote its goals and deter internal entropy, the more disorder and

entropy are created in the firm's environment: decimated rainforests, depleted soils, ripped up landscapes, clear-cut forests, degraded water sources, fouled air, "downsized" workers, junked obsolete technology, weakened indigenous industries, corrupted civil governments, etc.⁵ The firm, in this sense, is at war with society. The only way a firm can sustain itself over time is to have a favorable energy-to-entropy ratio. *To achieve such a favorable ratio is the central driving force—the core motivator—of business activity.* Business's "bottom line" is set by thermodynamic nature, not by accountants, stockholders, or Wall Street's financial analysts, who act only as nature's calculators and numerators.

The formula then would be: Take advantage of the first law to acquire the needed energy. Then outwit the second law by increasing the firm's efficiency and dumping your degraded energy where you don't have to deal with it any more. By doing that, you can have your energy cake and eat it too. That is precisely what business firms do, or at least try to do, all the time. It's called *economizing*: an attempt to acquire enough energy (in the form of capital, technology, natural resources, people, information, skills) to produce something of marketable value (goods, services, information), using revenues and borrowed funds to build and maintain an organizational structure and expand the firm's operations, while minimizing costs.

Economizing is the core bedrock function of business firms everywhere. As a life entity—as a coalition of biological agents acting collectively—the firm must economize if it is to exist, function, and grow. In that respect, it mirrors the selfsame economizing activity that is found in every living organism. It draws energy in, uses it productively, and expels the entropic wastes outward into its environment. All organic life taken collectively does this repeatedly. Indeed, it is an imperative if there is to be life at all. Within the Evolutionary Firm itself, economizing is such a powerful, unyielding, natural imperative that it takes precedence over all other incentives and motives. Presenting a favorable "bottom line" is every manager's goal. Shareholders expect, Wall Street presses for, institutional holders demand, and directors yearn for positive economizing results.

The larger significance of business economizing, aside from its importance for each individual firm, is that the societies who host such firms depend upon this vital process if there is to be human collective life. In this regard, it is possible to say that the economizing business firm is one of nature's most brilliant, though flawed, inventions.

Thermodynamic Selection versus Natural Selection

From a thermodynamics point of view, a business firm is an aggregation of energy forms carrying out economizing functions. The energy may take several different forms. It can be the *organic energy*, mental and physical, of the people who work there. Or a firm's energy can reside partly in its *physical structures, buildings, and equipment*. *Process materials* such as electricity, water, air, geological derivatives, organic substances/derivatives make up another part of the

energy inventory, for all of these make work possible. One active energy component is *technology*, both physical machinery and abstract symbolic, computerized processes. Add in *organizational structure/pathways/linkages*, and *information/knowledge/data banks* through which the firm does its work. If the firm is to economize successfully, the costs of all of this incoming and aggregated energy—labor, materials, information, capital, technology—must be minimized, as must the costs of using the energy for production, organization, and distribution.

As noted earlier, the firm as a whole is not an organism, although it has organic parts. Unlike its organic constituents, the firm has no DNA, no immune system, no tissue repair, no central nervous system. Its organizational economizing is extra-cellular and extra-organismic in form and structure while still employing the various kinds of biophysical energy it acquires and controls. Firms lack the reproductive-replicative functions of cellular-organic entities, and in that sense the firm departs dramatically from the organic norm of generational genetic succession. Its goal is simpler and more stark: to push entropy away from itself, as far away and for as long as possible. The firm shares this goal with all living organic entities who could not themselves live to pass their genes on to future generations if they did not first meet the test posed by entropy.

The firm's active *organic* core is a coalitional undertaking, a group of interacting (and at times competing and quarrelsome) biological agents whose collective efforts seek economizing results. While acting in behalf of the firm, these interlinked biological agents and the activities they undertake are subject to selection pressures. They may succeed or fail, survive or perish, be selected for or selected against, face the same entropic degradation as any organic being that tries to economize.

The kind of selection that operates on the business firm as a whole is what I shall call *thermodynamic selection*, which occurs when the firm either successfully responds to entropic pressures by economizing, or fails to do so. In this sense, the entire firm—all of its functioning parts, its technology, its organizational systems, its resources, and not just its individual organic components—is being selected for or against. The same challenge confronts all organic entities, including the very first ones to have appeared on Earth: “[T]hese first beings would have metabolized and incorporated energy, nutrients, water, and salts into their developing selves . . . to postpone return to thermodynamic equilibrium” (Margulis and Sagan 1995: 62). Failure of the firm to economize leads to a loss of order (financial and organizational) and its subsequent demise, called “bankruptcy” in the business lexicon, or “thermodynamic equilibrium” in physics. When this occurs to a *living organism*, it is called *natural selection* and may be traceable to a genome lacking some important adaptive trait. *Thermodynamic selection*, on the other hand, affects *all organized entities* whether they are living or nonliving, while natural selection occurs only among biological organisms. Thermodynamic selection is the broader, overarching (and primordial) process, leaving natural selection to be seen as one variety in a larger system of evolutionary selection.⁶

The Growth Imperative

A thermodynamic specter haunts the lives of all who occupy places within and outside the Evolutionary Firm—its directors, managers, employees, stakeholders, and dependent communities. Because the EF, as a successful economizer, may generate entropy in proportions equaling or even exceeding the levels of incoming energy, information, and order, it feels the pressure of thermodynamic selection keenly. It risks having its pollutants outrun its production, its costs exceed its revenues. Howsoever efficient its use of energy, entropic wastes may pile up at an even faster pace. As technology and information (other forms of energy) seem to lift it out of the entropic slough, the firm's organizational systems may (and often do) impede the acceptance of the new technologies while information overload (e.g., torrents of e-mail messages) clogs communications and usage channels. Order and regularity may slide toward disorder and chaos. As economizing flags and entropy looms, excess personnel are let go ("downsized"), inefficient plants are closed or moved to low-cost nonunionized areas or Third World locales, services are outsourced, budgets are trimmed, managers are put on notice to reduce costs—or else.

Entropy is a voracious beast with an unlimited appetite. Feeding its maw is a case of hope struggling against fate. Vaguely but uneasily aware they are up against an implacable enemy, the EF's managers must search for ways to enhance productivity while reducing or foregoing costs. They turn first to expansive growth. Their laboratories and product development departments bring out new products; their marketing programs seek to undercut rivals by increasing the firm's market share; their global strategists explore and exploit ever-widening markets around the world; they flog their suppliers to reduce costs and speed deliveries ("just-in-time"); their shrewd financial analysts identify ways to diminish competitive pressures by merging with or acquiring competitors, or to expand through technology-sharing alliances, market-sharing joint ventures, let's-not-compete partnerships, or government bail-out deals. Presumably, though often dubiously, such expansive arrangements are claimed to enhance the firm's productivity, profits, and overall economizing. While the true verdict may be long in coming, the firm enjoys a peaceful and joyous interregnum when it is believed that the entropic monster has been sated, at least until its stomach is heard to rumble again. Expansive growth in this sense is an unavoidable extension of the EF's basic economizing impulse. Stasis risks decline and eventual dissolution.⁷

Growth of the EF can be greatly enhanced if ways can be found to discard its ever-increasing entropic load into the environment of the communities in which it operates. As its growth creates jobs and produces new products and services—thus improving the firm's and the community's economic stature—so too does the community become the EF's sink for degraded energy, setting up a two-way exchange between firm and ecosystem: energy in, energy and entropy out. The EF's borders, its outer boundaries, its membranous outlines are entirely porous and nonconfining, and in this sense the firm is an open

system able both to engulf energy and belch out the unwanted degraded forms remaining after its economizing efforts that are welcomed by all. Business and society are thus locked in an inescapable embrace enjoyed by both in the short run (jobs and growth) but by neither in the longer run (when new technologies displace employees and disrupt communities, and the firm encounters the limits of entropic disposal). This flow, this firm-environment exchange literally keeps the firm viable while simultaneously showering its sphere of operations with both life-supporting jobs and new products, as well as life-diminishing entropic wastes.

Discipline and Renewal

Undergirding and reinforcing the centrality of economizing as the EF's Motivator/Driver is the training and disciplining of the business professionals who together make up the directing and controlling coalition. Corporate culture is honed, shaped, and cultivated in ways that drive home the necessity of possessing, displaying, and improving high levels of cost consciousness, a dedication to the firm's well-being even at cost to one's own self, displaying an enthusiasm for and a loyalty to the firm's policy goals and strategic moves, and on occasion concealing, distorting, and falsifying information otherwise detrimental to the firm's ongoing operations.

The list lengthens of companies successful in inculcating such values in coalition members: Enron's go-go culture was enthusiastically embraced by employees throughout the company (Banerjee 2002); Arthur Andersen's auditors were key players in preparing less-than-fully truthful financial reports for a number of firms and ordering the destruction of files sought by government investigators; Xerox, WorldCom, Dynegy, Global Crossing, Lucent Technologies, PNC Financial Services, Tyco, and between 150 and 200 other companies have "restated earnings" under pressure from regulatory officials, meaning they falsified earlier reports.

Such attitudes and values supportive of corporate culture are not infrequently found to be highly prized in management training schools of universities—a kind of MBA boot camp—where tomorrow's elite corporate soldiery ("a few good men") are sought by a company's "recruiters." Thus, fresh sources of energy flood into the lower levels of the EF, where they will be channeled to promote the company's central economizing purposes.⁸

The Firm's Moralizer/Valuator Function

The modern large-scale business corporation—the Evolutionary Firm—is imbued with behaviors and operations that acquire a moral tone as a consequence of their impact on human affairs. The firm gives moral effect to, *and* is a moral expression of, identifiable natural forces that embed a moralizing function deep within the firm's structure and being.

In thus showing a moral face, the EF draws on three distinct but overlapping kinds of innate brain-based neuronal circuitry. Evolutionary psychologists and cognitive neuroscientists often call these hard-wired circuits “algorithms,” which are problem-solving or sense-making procedures. Sometimes, they are labeled “neural modules,” which are groups of interacting neurons that are activated when certain distinct kinds of environmental situations arise. Those hard-wired modules most prominent in defining the firm’s Moralizing/Valuator function are *economizing algorithms*, *symbiotic-moralizing algorithms*, and *emotive algorithms*, each to be described below. (A fourth set of algorithms expresses power-dominance predispositions, thus supporting a wide range of normatively questionable corporate actions, to be identified later on.)

A company’s coalition members—its directors, managers, employees, et al.—draw upon a suite of these algorithmic possibilities, some impelling them towards economizing goals, others seeking cooperative-symbiotic actions, and still others evoking a range of strong emotions that condition, channel, and solidify decisions taken in behalf of the firm. From this melange of interacting, overlapping, algorithmically-driven behaviors emerges the moral substrate of the EF upon which it judges itself and is judged by others. Whether it will be considered to be acting in morally acceptable ways or, to the contrary, to be partially or grossly immoral, depends largely (but not entirely) on the particular ideological-sociocultural context from which such judgments are launched. More fundamentally, though, the basis on which the EF can be seen to display moral content is its effect on the survival, adaptation, and qualitative efflorescence of those people and communities who come within its orbit as a Darwinian survival machine struggling against the entropic tides of a thermodynamic universe.

The central thesis of the paper can now be stated: *The moral traits, features, habits—and ultimately the moral problems, puzzles, and dilemmas—of the Evolutionary Firm are a product of contradictions embedded in diverse neural algorithms that motivate and activate the behavior of the firm’s coalition members and thence, through them, the firm’s aggregate operations.* For these reasons, the EF is not only its own worst enemy but cannot avoid moral condemnation by others both inside and outside the firm. The firm is reflexively immoral for reasons beyond the control of its participants while simultaneously preserving and promoting what is arguably the central moral principle—economizing—on which all life depends. Nature has indeed played a cruel trick on humankind. Just how it was done takes us deeper into the business firm’s Moralizer-Valuator function.

Evolutionary Algorithms

Leda Cosmides, frequently collaborating with John Tooby, has been the leading advocate of the view that modern human behavior owes much to our ancestral past, especially the experiences of hunter-gatherers who lived during the Pleistocene

(Ice Age) era from two million years ago to fifty thousand years ago (Cosmides and Tooby 1992). It was during this period that the modern human brain took shape and became the powerful computational tool we now possess. In confronting and resolving the many different kinds of survival and adaptational problems that arose, the hunter-gatherer brain became specialized, developing domain-specific neural algorithms that matched the challenges presented by the Pleistocene environment. Our modern brains bear the deep imprint of our ancient forebears. We are wired for Pleistocene times while living in the Age of the World Wide Web. The peculiar moral problems of the EF are one result.

The three major sets of neural algorithms inherited from ancestral times that activate the Moralizer-Valuator function in the modern business corporation are depicted in Figure 3.

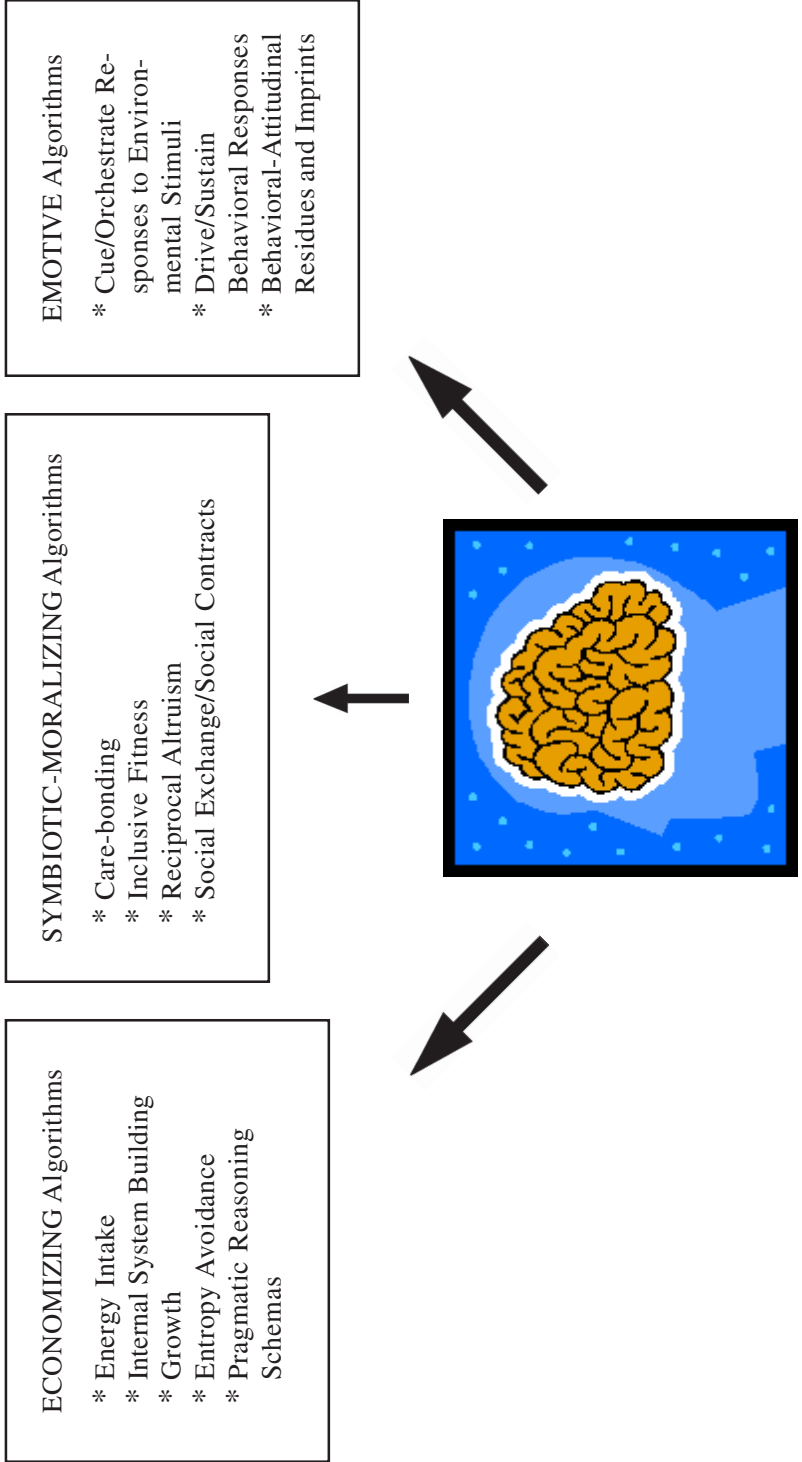
Economizing Algorithms

Much of this story has already been told above. The energy capture required for adaptation, survival, and outwitting entropy in ancestral times took the form of hunting, gathering, and scavenging. Social systems in the form of family, clan, band, and tribe extended humans' economizing reach (Flannery 1995). Faced with real problems, risks, and dangers requiring judgment, skills, prediction, and cause-and-effect understanding, pragmatic reasoning schemas emerged as sense-making and problem-solving methods (Cheng and Holyoak 1985; Reader and Laland, forthcoming; Finlay et al. 2001). Each of these three economizing modes—energy capture, social system building, and pragmatic reasoning—was a response to one or more environmental challenges. Over long periods of evolutionary time, brains capable of confronting and resolving such challenges evolved. As Cosmides has argued, brain form follows function; so if the brain has a set of neural modules that enable it to economize, it is because such challenges were successfully met in the ancestral past. *It is that same brain that drives the economizing actions and motives of the coalition members of the modern business corporation.* As evolutionary biologist Ernst Mayr says, “the human brain seems not to have changed one single bit since the first appearance of *Homo sapiens*, some 150,000 years ago” (Mayr 2001: 252).

Symbiotic-Moralizing Algorithms

Behavior that draws people together in common cause through cooperation, mutual defense, nurturance, caring, and sympathetic bonding has long been typical of the human experience. Frans de Waal (1996; 2001) and other primatologists have effectively demonstrated similar behavior among chimpanzees, bonobos, and (to a lesser extent) gibbons and orangutans (Whiten and Boesch 2001), thus extending its origins far back in evolutionary time. One well known evolutionary biologist, Lynn Margulis (Margulis and Sagan, 1986; 1995), has argued that life itself, especially some of its earliest forms, emerged from a process of symbiogenesis when simple, primitive life-precursors were joined

Figure 3
ANCESTRAL ALGORITHMS OF THE BUSINESS MIND



together into viable units capable of metabolizing energy drawn from the environment. *Care-bonding* of parent and offspring, while not found among all living creatures, is presumed to have been selected for among many mammalian groups, thus leading to the formation of human family groupings (Wilson 1993), with chimpanzees again leading the way. Kinship bonds that produce an *inclusive fitness* for close kin are present among the social insects and other organisms, as well as humans (Ridley 1996). *Reciprocal altruism*—acting to promote the reproductive interest of others, even against one’s own similar interests, and even for unrelated strangers—is another form of mutualistic behavior appearing in the ancestral record (Mayr 2001). So, too, is mutually advantageous *social exchange* an ancient practice among humans, leading to the emergence of *social contract algorithms* (Cosmides 1989; Cosmides and Tooby 1999; Frederick and Wasieleski 2002), primitive trade, early markets, and eventually modern market exchanges (Polanyi, Arensberg, and Pearson 1957; Bohannon and Dalton 1965; Dalton 1967; Braudel 1982). All of these symbiotic linkages find additional reinforcement in a whole host of other *ecological mutualisms*, many of them summarized in Frederick (1995, chap. 6).

Over long stretches of evolutionary time when ancient peoples repeatedly encountered environmental situations favorable to the activation of these symbiotic-moralizing impulses, and especially when they carried adaptive and reproductive advantage, brain circuitry to support such cooperative, symbiotic behaviors emerged to become a part of both Pleistocene and modern-day brains. Behavior that acknowledged the dependence of individuals on one another to promote their own and their collective interests thus entered the human realm very early. Only at a much later time did it acquire the label of “moral” behavior.⁹ Today’s Evolutionary Firm harbors traces of these ancient symbiotic-moralizing algorithms, even in the midst of furious, intense economizing that often overrides and ruptures their mutualistic tendencies. It is precisely at that algorithmic crossroads where one finds the most intractable moral dilemmas of today’s Evolutionary Firm.

Emotive Algorithms

Neuroscientific study of the emotions remains at a very early, even primitive stage of scientific investigation, so there is considerable uncertainty about emotion’s meaning, origin, function, and relationship to other parts of the algorithmic human brain. The twentieth century alone recorded more than 90 definitions of “emotion” (Plutchik 2001). Some cognitive neuroscientists (Panksepp 1998; Damasio 1994; 1999) begin with the brain’s physical structure, attempting to identify the incredibly complex interactions that occur among the tangle of several billion neurons and thereby to pinpoint the precise locales where various emotional impulses seem to arise. Others, many of them psychologists (Ledoux 1991; Cosmides and Tooby 2000), propose functional theories about emotions that surge outward from the brain to spill over into human behavior. Both groups agree that emotions, however defined and wherever located, play a

central, vital, even directive role in human behavior. If that is so, the implications for the behavior found in business firms are profound indeed.

The position here will be that the human brain houses a set of emotive algorithms formed during ancient times as our ancestors interacted with an environment filled with dangers, threats, unforeseen and unforeseeable risks, as well as opportunities and potential windfalls that could boost survival and reproductive chances. According to Jaak Panksepp (2000: 144), who has traced their likely locales in the brain, the predominant emotions that emerged over evolutionary time were “FEAR/anxiety, RAGE/anger, PANIC/separation, LUST/sexuality, CARE/nurturance, PLAY/joy, and SEEKING/exploration [i.e., curiosity].” His research reveals the presence in contemporary human brains of neural algorithms expressing each of these emotional states, with overlap among and between some of them. Robert Plutchik’s (1994; 2001) list of “eight bipolar emotions” is closely similar: joy/sorrow, anger/fear, acceptance/disgust, surprise/expectancy, with many subtle combinations, permutations, and intensities being possible.

Their presence within the modern human brain would have to mean that such emotions are potentially capable of becoming—and are likely to be—a part of everyday life in the modern corporation, expressed primarily by members of the firm’s human coalition as they interact with each other and as they come in contact with others outside the firm. But for what purposes and towards what ends are these evolutionarily embedded emotive algorithms expressed as they surface in day-to-day business operations? If they originally emerged and were selected for their functional usefulness as survival-and-reproductive capabilities in ancient times, do they continue to do so today, say, in the actions of corporate directors, managers, and employees?

Here, the views of Leda Cosmides are most useful. She hypothesizes that the brain’s emotional programs orchestrate the responses an organism must make when confronted with environmental challenges if it is to survive, adapt, and reproduce.

Emotion programs . . . have a front end that is designed to detect evolutionarily reliable cues that a situation exists (whether or not these cues reliably signal the presence of that situation in the modern world). When triggered, they entrain a specific set of subprograms: those that natural selection “chose” as most useful for solving the problems that situation posed in ancestral environments. . . . Far from being internal free agents, these programs have an unchanging structure regardless of the needs of the individual or her circumstances, because they were designed to create states that worked well in ancestral situations, regardless of their consequences in the present. (Cosmides and Tooby 2000: 93)

Jaak Panksepp concurs: “There appears to be a set of circuits situated in intermediate areas of the brain . . . that have been conceptualized as sensory-motor emotional command circuits. That is, they orchestrate coherent behavioral,

physiological, cognitive, and affective consequences They are emotions like fear, anger, sadness, joy, affection and interest” (Panksepp 2000: 143). “Prior to the emergence of complex cognitive strategies, animals may have generated most of their behavior from . . . primitive emotional systems. . . . These simpleminded behavioral solutions were eventually superseded by more sophisticated cognitive approaches” (Panksepp 1998: 135).

Another cognitive psychologist goes further: “For important adaptive tasks, emotion can be more efficient than cognition. . . . Emotions, like motivations, are substantially domain-specific and are part of the heuristics in the [Darwinian] adaptive toolbox” (Gigerenzer 2001: 138).

Among the factors that can thus be directly influenced, shaped, and channeled by emotive algorithms are, quoting Cosmides, “perception; attention; inference; learning; memory; goal choice; motivational priorities; categorization and conceptual frameworks; . . . behavioral decision rules; communication processes; . . . affective coloration of events . . . ; situation assessments, values, and . . . self-esteem” (Cosmides and Tooby 2000: 93). Translate each of these into the language and work of the business firm, and you have the equivalence of emotions cuing and conditioning almost every aspect of work life—from goals to motives to rules to values and to the many behavioral and attitudinal subtleties of what is now known as corporate culture. Likewise, Panksepp’s rage, fear, lust, panic—as well as care, play, and exploratory curiosity-seeking—surge through the ranks of the corporate citizenry unceasingly, providing channels of expression and communication through which the firm’s work is done.

The Evolutionary Firm’s instrumental economizing and its moralizing impulses are thus orchestrated, even directed, by and through emotive algorithms of ancient lineage. For example, the pride and confidence stemming from *authoritative* knowledge-based skills and accomplishment can be matched (and often is offset or cancelled) by the exultant hubris generated by holding and wielding *authoritarian* dominance power. Or the joy and comfort found when cooperative team efforts pay off can quickly sour and turn into anger, frustration, disappointment, and cynicism when a power hierarchy’s demands or a bureaucracy’s smug sluggishness take precedence. One way to strip away the emotional ties that sometimes develop within corporations is to change official language. For example, Boeing Company at one time referred to employees as members of “a family” but then switched to calling them “team” members, causing one twelve-year veteran engineer to say, “You can lay off a team member, but to get rid of a family member is a little harder to do.” Boeing subsequently found ways to shed thirty thousand “team members” (Goodin 2001: A-8).

Similarly, the pleasures of achieving goals, however well done, fade into bitterness and anxiety in face of layoffs and downsizing demanded by a faceless command structure seeking to preserve its power and domination through ever more effective economizing. Rage, anger, fear, panic, disgust, vengeance flicker through the corporate structure like small bolts of lightning, while executives find reasons and passions to justify decisions made in the name of

economizing and power-holding. No better example exists than Enron. As Cosmides reminds us, a firm's biological agents are "*far from being internal free agents,*" driven as they are by "an unchanging [ancestral] structure *regardless of the needs of the individual . . . in the present*" (Cosmides and Tooby 2000: 93, emphasis added). Hence, evolution's legacy in the form of emotive algorithms takes its toll on the very people who carry them and whose behavior they cue and orchestrate.

On a more positive note, corporate managers have been urged to recognize and accept the emotional nature of employees when planning major organizational changes, recruiting rather than denying their feelings and emotional needs (Fox and Amichai-Hamburger 2001). Another study demonstrates that a deliberately induced policy of encouraging emotional interactions with customers creates positive attitudes about a company and hence pays large economizing dividends (Pugh 2001). What has been called "emotional intelligence" helps organizational members adapt to change, and an organization's "emotional capability" is one measure of its strategic success (Huy 1999). Reinforcing these findings is recent evidence from neuroscience that moral judgments are affected by the amount of emotional engagement people have when facing a given moral dilemma (Greene et al. 2001; Blakeslee 2001).

Algorithmic Moral Contradictions

In these several ways, both practitioners and students of the modern corporation confront the moral dilemmas, and the moral opportunities, posed by nature's ways: a veritable tangle of overlapping, inconsistent, and ultimately contradictory neural algorithms lying at the heart (and in the brain) of today's business practitioners.

Contradiction No. 1: Economizing circuits drive the firm and its members to fend off life-threatening entropy, although these very actions generate an increasing wave of entropy and chaotic disorder that disrupts and sometimes tears asunder a community's symbiotic linkages. Thus, economizing algorithms contravene and contradict symbiotic-moralizing algorithms.

Contradiction No. 2: Symbiotic-moralizing circuits impel coalition members towards cooperative, mutualistically supportive organizational behaviors that clash with and often lose out to the dominant economizing impulses, if they are not actually put in the service of the firm's economizing goals and its managers' self-aggrandizing behavior. Thus, symbiotic-moralizing algorithms vital to the organization's operations contravene and contradict both economizing and power-aggrandizing algorithms.

Contradiction No. 3: Emotive circuits cue a range of adaptive reactions to the risks, dangers, and opportunities presented by a high-velocity competitive market environment, stirring up intense

emotional storms that can and do threaten both the achievement of economizing goals and the organizational acceptance of mutualistically advantageous symbiotic operations. Thus, emotive algorithms contravene and contradict both economizing and symbiotic-moralizing algorithms.

These nature-induced moral contradictions embody the EF's central ethical dilemma. Two million years of human evolution and genetic embedding have laid them at the corporation's doorstep and implanted them in the modern business mind. They must be recognized for what they are and for the behavioral constraints they bring to a search for ethical resolutions.

How the Evolutionary Firm Makes Choices

One may ask if there is a priority system that sorts out and regulates the inevitable tensions among the urges and impulses generated within the minds of business practitioners. The EF can be expected to have an array of algorithmic possibilities on which it can draw, all of which are accessed through the biological-agent members of the firm's dominant coalition. We also know that the coalition is normally constrained to act collectively in behalf of the firm's economizing goals. In doing so, the coalition's human members are subject to *natural* selection, which favors those traits and features that support the members' own reproduction and gene replication. But in the case of groups of organisms—here, the collective interests of the entire firm—*thermodynamic* selection favors behavioral practices that extend the economizing life of the firm in face of ever-threatening entropic decline. In short, if the firm is to survive, be self-sustaining, and grow to its full economizing potential, it *must* conform to what I shall call the Logic of Evolutionary Effect (LEE).

The Logic of Evolutionary Effect embraces both natural selection *and* thermodynamic selection. As noted earlier, thermodynamic selection pressures are necessarily the more comprehensive, more persistent, more compelling of the two kinds of selection because they select for the structural and functional features that permit life to begin and persist (Margulis and Sagan, 1986; 1995). Only when that metabolic state has been attained can natural selection that primes the reproductive and gene replicative processes go forward.

The Logic of Evolutionary Effect works its influence on *all* algorithms found within the human brain, including the three types discussed here: economizing, moralizing, emotive. Those with positive thermodynamic effect will be selected for, i.e., favored and sustained. *In the case of the Evolutionary Firm, economizing algorithms are consistently selected and favored by LEE*, and they thus have emerged as the dominant motivating force behind the firm's decisions, operations, strategies, and policies. Moralizing algorithms appear to be selected only when producing an economizing effect for the firm or when their entropic drag is slight. Emotive algorithms occupy a somewhat middle ground inasmuch as they may cue behaviors conducive to economizing outcomes, and

thus be selected, or they may in some instances orchestrate actions that plunge the firm into passionate controversy, conflict, and possible dissolution.

The EF's consistent focus on economizing ("profits before people," "greed before good," "good ethics is good business"), along with the subordinate position it assigns to morality ("moral muteness," "codes of ethics"), plus strenuous efforts to abolish emotional expressions from the workplace ("love," "lust-sexuality," "displays of temper")—all are strong hints of an algorithmic priority system set by nature itself, and which constrains and moderates the choices made by business practitioners. Typically, these choices place the highest priority on economizing.

Those who despair of this state of affairs can take comfort from the variations that occur around the EF's priority norm of economizing. The Moralizer/Valuator function of any particular business firm varies with the diversity of its biological agents who, though not entirely free agents, are nevertheless inheritors of variable genetic traits and the predispositions they engender. The algorithms passed on through evolution represent statistical averages and probabilities generalized over many generations. They induce predispositions to behavior, not precise behavioral regimes. They outline possibilities, not certainties or rigid routines. For any given person, their operational effect is therefore unpredictable except in a very general sense. When multiplied by the numbers and types of people found within any given business firm at any given point of time, the lack of predictability of their moral state is magnified by several orders of magnitude.¹⁰ The dominant inner core of the EF's human coalition—the directors, executives, and managers—may itself display a diversity of algorithmic inheritance that can cause the firm to lurch from one strategic (and moral) stance to another. Most employees are kept in line by training and disciplined supervision, but because they too are the inheritors of neural algorithms they can be a rich source of independence, creativity, moral imagination, resistance, and even rebellion, including an occasional whistle-blower. Primary stakeholders—suppliers, dealers, consultants—bring additional attitudes and inclinations that may fit uneasily and roughly (or well) into the economizing grooves gouged out by nature.

For all of these reasons—each one itself a product and expression of natural algorithmic impulses—the EF's strict economizing focus may be constrained and redirected by some varying combination of moralizing and emotive algorithmic forces. After all, Malden Mills CEO Aaron Feuerstein's humane decisions at a moment of financial crisis reflected a different proportion and mixture of economizing, moralizing, and emotion than those made by Enron CEOs Jeffrey Skilling and Kenneth Lay and CFO Andrew Fastow, whose self-aggrandizing decisions brought a powerful firm to the brink of financial disaster. Longtime students of corporate social responsibility recognize the difference between Johnson & Johnson's life-saving decisions during the Tylenol contamination crisis when consumer welfare was ranked higher than short-run profits, and the more recent defective-tire fiasco at Ford-Firestone where the economic and

legal standing of both firms seemed to outweigh official concern and regret for the loss of human lives.

The lesson here is not that innate predispositions can be summarily denied or that human agents are completely free to pick and choose among the algorithms that nature has implanted in their genomes. The Logic of Evolutionary Effect has set a probabilistic pattern, created a framework, designed a system, and assigned priorities to the work of the Evolutionary Firm. Business practitioners are bound to act, make decisions, and set policies guided by these broad evolutionary guidelines, especially where (or because) economizing tends to dominate corporate operations. The diversity that is reflected in the varying algorithmic patterns of the firm's biological agency is the source—a kind of escape valve—that registers whatever degree of decision-making latitude one finds among those who occupy key positions in the collective whole.

The Moral Force of the EF's Other Nature-Based Functions

As should already be evident from the above discussion, the centrality of economizing as the principal driving force of business creates a great wash of moral dilemmas for those both inside and outside the firm. These are the most wrenching, most intractable ethical problems posed by the Evolutionary Firm. However, the story does not end there, for the EF's other functions also carry moral weight, which can be briefly identified but not fully discussed here.

The Innovator/Generator function (as shown in Figure 2, above) is derived from an underlying natural process: the spontaneous generation of symbolic representations by the human central nervous system, particularly the neocortex that houses the brain's principal cognitive, calculative capability. From that neurological seat arise the tools, language, and behavioral guides that enable the firm to economize, innovate, and achieve a productive output. Here, too, resides the brain's "wild card," the source of new insights, the fount of creativity, the imaginative intelligence that generates new ways of seeing, thinking, and solving problems. These cerebral symbolic processes are the leading edge of human adaptation, the principal means we have of surviving and flourishing in an evolving world. As a human generative force housed within a corporate shell, this uniquely creative symbolic pulse gives the Evolutionary Firm its principal moral and social justification. Its never-ending innovations—from silicon chips to World Wide Web, from cell phones and DVD to pacemakers and computers-on-a-molecule—energize and vivify an essential economizing process, greatly amplifying the adaptive range of life options available to the human species. Turned outward towards the burgeoning needs of a global society, rather than being focused exclusively on the EF's own goals, this generative force holds great moral promise for a better human future. Take note, those who would redesign the Evolutionary Firm.

The EF's Organizer/Coordinator function is based upon two underlying natural features. One is a power-dominance natural impulse that is *emotively driven*; the other a system of linguistic linkages *cognitively driven*. Power-dominance organizes the firm as a vertical status hierarchy; language and data flows organize it technologically and horizontally. Both systems tie the firm's coalition members together and help coordinate their workplace activities. The resultant network focuses power, information, and decision making in a managerial elite that seeks to aggrandize its own interests and (where possible) those of the firm.

Some of the most intransigent moral dilemmas of the EF center on the use of dominance and power by a corporate elite that is often unmindful of the needs, interests, and welfare of others within and outside the corporation. Even a company's economizing goals are often made to yield to the self-aggrandizing urges and impulses of top-level executives, hence undermining the principal adaptive morality of the firm itself. Executive insiders of now-defunct Global Crossing cashed out \$1.3 billion of their personal holdings in the company as it slid toward bankruptcy and ruin, even outdoing Enron's insiders who dumped about \$1 billion worth of that company's stock under similar circumstances (Bryan-Low 2002). As his company was collapsing and its stock losing value, Enron's CEO sold \$20 million of Enron stock *back to the company* while telling other investors and Enron employees that their own holdings would soon have "a significantly higher price" (Norris and Barboza 2002). In another case, Enron Broadband executives spent \$2 billion setting up high-speed transmission cables across the U.S., but as one source later reported, "Enron Broadband was a colossal [financial] catastrophe." However, Broadband's CEO got \$72 million by selling off his stock, and the firm's president took in \$35 million the same way. Another Enron subsidiary lost \$17 million in 2001's third quarter, then it was put up for sale at a \$200 million loss, while its chairman walked away with \$75 million from stock sales (Fields 2002).

In all likelihood, the radical conflicts of interest between executives and their firms reveal the active presence of a fourth kind of neural algorithm driving the business mind: a power-dominance circuitry that predisposes to the capture, retention, and magnification of power and influence, to be wielded first for personal gain and secondarily for the company's benefit. Evolutionary psychologist Denise Cummins (1998) traces this behavioral predisposition to ancestral times: "[S]pecial reasoning architecture evolved [among apes and humans] to handle problems that are repeatedly encountered by individuals living in dominance hierarchies, problems that directly impact survival rates and reproductive success" (Cummins 1998: 30). She points out that in a social world organized along dominance lines, the keys to success and survival came in two different forms: obliging others, and guile. Guile apparently won the day at Enron, WorldCom, et al.

An Enabler/Strategizer function reflects the complex, nonlinear ecosystem landscape on which the EF must maneuver if it is to survive, adapt, and

expand its sphere of economizing influence. Mutualisms—life-supporting symbiotic linkages—abound within all ecosystems; indeed, they literally define what an ecosystem is at its core (Wilson 1992, chaps. 9 and 10). A firm's economizing success depends almost entirely on identifying, forming, and developing mutually beneficial ecological alliances with others, whether firms, governments, or institutional stakeholders of all varieties. Its economizing goals are achievable only through such ecologizing strategies. Finding, keeping, and expanding an economic niche calls for pushing back the chaotic disorder that is typical of such environments and for developing pragmatic intelligence to match the competitive challenges encountered. Complexity theory's "strange attractors" that orient the EF within an ever-shifting competitive marketplace are nothing more nor less than the firm's values and moral/immoral commitments, and these will determine whether the firm survives at the edge of chaos or plunges into uncontrolled chaotic-entropic disorder (Frederick 1998). This possibility alone should motivate an active search for values that sustain not just the EF but all others whose fate is tied to its fortunes.

In the end, it is worth remembering that the modern Evolutionary Firm remains one of nature's ongoing evolutionary experiments—a mere 200+ years in the making—with the long-run outcome not yet clear. The average life expectancy of a typical large-scale corporation today is forty to fifty years; only a handful have lived more than a century (de Gues 1997). Most smaller-scale firms last less than ten years: in the U.S. seventy to ninety percent of small firms fail in the first ten years, in the UK around seventy percent, and forty-eight to sixty-eight percent in Canada are gone before a decade is out (Stanworth et al. 1998; Monk 2000). Configured as it is, the Evolutionary Firm's long-run prospects do not seem too promising. It may not be important that the Evolutionary Firm as we know it today lives to see the end of the present century, but if it fades away nature will need to replace its several functions with equally vigorous ones housed in another organizational shell because in its present form the EF sustains huge swaths of humanity through its economizing vigor, even though it does so with sometime grievous moral consequences.

Whatever Happened to Culture?

In this account which has leaned so heavily on nature for an explanation of business behavior, it is reasonable for one to ask: But what about culture? Should we not heed the anthropologist who, for almost as long a time as Charles Darwin, has explained human behavior as a manifestation, not of biology or physics, but of culture? Has not the concept of corporate culture, now well into its third decade of use, proved to be a valuable way of tracking, understanding, and perhaps even improving business behavior? Must the natural sciences displace, or even *replace*, the social sciences in order to advance our understanding of the business firm?

To this challenge, there are two answers, neither of which can be adequately discussed on this occasion. A first observation is that the standard social science model that favors a *tabula rasa* concept of human learning, behavior, and development is being seriously eroded by the research of cognitive neuroscientists, evolutionary psychologists, geneticists, evolutionary biologists, primatologists, and paleontologists (Tooby and Cosmides 1992). Human behavior is now understood to be a function of natural systems—brains (Calvin 1998), genes (Dawkins 1989), climate (Calvin 1990; 2002), geography (Diamond 1998), ecology (Wilson 1992), anciently embedded ancestral impulses (Cosmides and Tooby 2000)—including even the basic grammars of language (Pinker 1994), the comprehension of music and artistic-aesthetic expressions (Jourdain 1997; Sloboda 1985; Barrow 1995), mathematical intelligence (Stewart 1995), and other traits once explained in purely cultural terms. The twentieth century saw the rise, domination, and decline of culture as an analytic tool (Degler 1991). The palette from which scholars now paint a human portrait is far richer in color, depth, and perspective than previously possible. The decline of culture and the rise of biology can be seen as an advance, as a filling out of the picture we seek to draw of the human—and business—experience.

The reason that makes it possible to celebrate rather than to regret today's greater reliance on the natural sciences—and this is the second answer to the basic question about culture's relevance—is the close, indeed, the inescapable kinship of nature and culture. Cognitive neuroscience now makes it possible to understand culture as an elaboration, an extension, a magnification, an amplification of cerebral symbol-making of almost unbounded human potential (Deacon 1997; Tattersall 2002). Culture in this view *is* nature. Not only can we now grasp Frans de Waal's (2001) point that our primate progenitor-cousins are capable of cultural behavior but we can in that way understand culture's debt to nature, as well as the lack of clear boundary between the two.

Corporate culture is truly a powerful analytic concept to both understand what goes on in business firms and to help managers do their daily work effectively. The EF's five nature-based functions undergird and make up the core of its corporate culture. Rather than a cloak that conceals nature's grip on the business mind, corporate culture illustrates the close bond between biological nature and symbolic culture.

Concluding Thoughts and Future Directions

Moral inquiry about business must begin with the Evolutionary Firm's Motivator-Driver function. Business firms are first and foremost economizing organizations, made that way by nature. All the wishful thinking in the world—even the most sophisticated philosophic speculations—will not make that feature go away. The firm's moral problems arise from contradictions rooted in behavioral impulses of the human psyche in interaction with an entropic universe.

Culture and reason can channel, moderate, and reconfigure—but cannot eliminate—these behavioral predispositions. Virtuous character can confront but not seriously deflect the natural course of embedded neural algorithms. Social contracts can design but cannot enforce or guarantee fair exchanges. Stakeholder claims on the corporation cannot exceed or violate the firm’s entropic limits. Philosophic principles and ideals not consistent with the firm’s natural architecture cannot be expected to prevail.

What then are the lessons for business ethicists to be found within the natural realm? Should one simply throw over the familiar ways of thinking, pre-Darwinian though they may be, that presently guide ethics inquiry? Does the naturalization of normative inquiry represent a revolution, perhaps even the emergence of a new Kuhnian paradigm? Those with long memories or great age may recall John Dewey’s plea, issued in 1920, for a “reconstruction in philosophy” that would situate philosophers more securely within an activist, pragmatic, progressive, evolutionary realm of inquiry (Dewey 1920). Alas, his petition was both ignored and rejected, and the hoped-for “reconstruction” did not occur—that is, not within conventional philosophy circles. But the post-1920 world of affairs rolled over human societies everywhere, leaving philosophers and the general public adrift without secure normative guidance in times of inflation, depression, dictators, war, social upheaval, genocide, and the use of hideous military technology.

Is there here a possible parallel with today’s business ethics inquiry? “Reconstructions” of the kind Dewey had in mind rarely occur in academia, as all would surely agree, nor is one of that magnitude imminent in business ethics. But a funny thing happened to the pre-1920 philosophers. While they weren’t looking, the world around them changed. They continued, at least in their own minds, to be “right” but no one cared. Today, one wonders if that might be true of our own field of business ethics. One hears the favorite mantras chanted over and over—corporate social responsibility, Aristotelian virtues, Kantian rights, Rawlsian justice, duties to stakeholders, corporate citizenship, etc., *ad infinitum*. At the same time, one witnesses the actions of Enron, Global Crossing, WorldCom, Tyco, and many other less spectacular scandals, rip-offs, cheating, embezzling, misinformation, fraud, etc. It causes one to ask: Is anyone out there in the business world listening to business ethicists? Have they become today’s pre-1920s philosophers: “Right,” but no one cares?

Does this mean that one should give up on moral analysis of business? By no means. What it means is that we must *begin* with what nature has bequeathed to business and to humanity. Within that bequest, one finds a brain marvelously attuned to meeting environmental challenges and finding ways to adapt, survive, create, experiment, explore, imagine, and expand the quantity and quality of life. That brain has carried *Homo sapiens* to its present state in evolutionary time, far and well beyond our Pleistocene ancestral base. Its very flexibility, creativity, and emotionality hints—and haunts one’s hopes and dreams—that it can point the way to a better moral life for the Evolutionary Firm and for human society.

Isn’t it time we looked Nature in the eye? Without blinking?

Notes

1. An increasing number of authors draw on research from the natural sciences to explain business and economic behavior: Ken Baskin (1998) uses DNA as a metaphor of corporate decision making; Gareth Morgan (1997) says organizations behave like living organisms; Nigel Nicholson (1998) points out that much organizational behavior is modeled on biological impulses; Barbara Pierce and Roderick White (1999) find analogies between organization types in simian social groups and certain types of business organization; Thomas Petzinger, Jr. (1999) describes entrepreneurial firms as complex adaptive systems seeking niches on fitness landscapes; Paul Hawken, Amory B. Lovins, and L. Hunter Lovins (1999) say an environmentally sustainable corporate strategy can be achieved by basing production on processes found in nature; Timothy Fort (2001) uses research on the cortex-imposed size limitations of viable human groups to argue for scaled-down corporate governance systems more expressive of human morality; Andrew Henderson, Ithai Stern, and Jungzheng Ding (2001) say the survival and death of individual firms and products can be explained by natural selection; Sandra Waddock (2002) recognizes ecology as the biological basis of global corporate citizenship; Paul Lawrence and Nitin Nohria (2002) propose that four nature-based drives underlie most organizational and business behavior; Michael Rothschild (1990), Matthias Ruth (1993), and Jane Jacobs (2000) are but three among several economists who use natural forces to explain the operation of economic systems.

2. Such moral judgments are not limited to questions of human welfare alone, as evidenced by the longstanding affinity between humans and domesticated animals, the ancient religious practice of totemism, and the more recent interest in preserving the diversity of non-human organic species and protecting laboratory animals subject to scientific research. Zoos, commercial (tourist) aquaria, unintended netting of dolphins, slaughter of baby seals, various kinds of hunting traps and snares, and, of course, human carnivorous eating habits have all come in for their share of moral disapproval.

3. In common usage, “energy” tends to mean the heat and work produced by petroleum, coal, electric generation, gasoline stocks, natural gas, nuclear power, and power generated by wind, water, and sun, and they are indeed among our most important sources of energy. However, in thermodynamics theory, energy has a much broader meaning and takes many different forms. Essentially, *energy is defined as the ability to perform work*. For long periods, *human muscle power* was a prime source of energy used for human purposes, supplemented much later by the work of domesticated draft animals. The *mechanical power* made possible by tools made of stone, bone, and wood was subsequently elaborated and extended through the industrial period, putting ever greater amounts of work energy into human hands. Today, *computational power* supports and makes possible entirely new forms of work, greatly multiplying the total energy that can be put to human uses. *Information* itself is a form of energy, whether patented formulas, data banks, business strategy plans, marketing programs, or financial analyses—all can be used to get work done. Another form taken by energy is the amount of *order* present in a given system, such as the organizational order of a business firm. One measure of entropy is the amount of disorder or randomness present within a system, with maximum entropy leading to complete disorder, dispersal of energy, and total randomness of all elements that were formally organized or ordered into a system. A system that has reached maximum entropy is also known as being in a state of thermodynamic equilibrium, and it is to avoid this kind of equilibrium that business firms engage in economizing operations.

4. In more formal theoretical language, one researcher has described the operation of these natural laws this way: “All processes occurring in the ecosystem, physical, biological or economic, are constrained by the first and second law of thermodynamics. The first law states that mass and energy are conserved in an isolated system. According to the second law, however, transformation of energy is always inefficient in natural processes. *As a result, materials and energy use can never be 100% efficient and will always result in the generation of waste products.* The first and second law of thermodynamics constitute core concepts of thermodynamics that govern material and energy use in the economic system and its environment” (Ruth 1993: 204, emphasis added; cf. Schneider 1988).

5. These are some of the negative effects of “globalization,” i.e., the rapid expansion and penetration of “foreign” ecosystems by the world’s premier economizing corporations. As an invader species, these firms typically disrupt long-established, settled community routines and life-support arrangements in the host ecosystems. Whether the economizing benefits introduced by the invaders offset the host community’s social and economic costs is a question of great complexity not easily decided, although there is no lack of very strong opinions voiced on either side. In any event, the phenomenon of new entrants into ecosystems is widespread in nature and has been for a very, very long time, so there is little of fundamental distinction to be found in the current “globalization” trend.

6. Thermodynamic selection (attaining either self-sustaining order or suffering chaotic disorder) also can and does occur among nonliving, nonorganic organized entities, such as certain chemical solutions, weather phenomena (e.g., a tornado or a hurricane), and the digitized agents in computer-simulated games or models. Speaking of archaic prebiotic chemical reactions during Earth’s formative period, Lynn Margulis and Dorion Sagan say this: “Catalysts were important *before life* because they worked against randomness to produce order and pattern in chemical processes. . . . Some of these ‘dead’ autocatalytic reactions form patterns whose increasing complexity over time is reminiscent of life” (1986: 53, emphasis added). Thus, thermodynamic selection, affecting even nonliving chemical compounds, predates natural selection that, by definition, began only when living organisms appeared on Earth. Additionally, an even more ancient, primordial type of prebiotic evolution—in this case, the progressive emergence of the elementary particles, elements, chemicals, and minerals in the early universe—laid out the pathways and constraints along which biological evolution would subsequently flow (Lima-de-Feria 1995: 97–105). After all, the elements and molecular components that make up the universe had been evolving some ten to twelve billion years before the Earth was formed some five billion years ago, and another half-billion years then passed before the earliest life forms appeared on Earth. That’s a very long evolutionary period when thermodynamic processes preceded the beginning of natural selection and, more importantly, continued thereafter and to the present day as a selection process.

This state of affairs that has produced two different concepts of selection—one thermodynamic, the other natural—is largely a product of the tendency of biologists to underemphasize, ignore, or even to shun physics. Their urgent focus on Darwinian theory, especially the genetics of neo-Darwinism, is understandable and has produced remarkable understanding of organic life, although their exclusive focus on the gene as the key unit of evolution has resulted in an overly narrow interpretation of the broader selection processes that produce change and order over evolutionary time.

7. Enron is not the only company that comes to mind. Media giant John Malone has been described in these words by *The Wall Street Journal*:

Mr. Malone spent 25 years building the biggest cable-TV operation in the U. S., becoming one of the most powerful and feared men in the entertainment industry before selling his Tele-Communications Inc. in 1999 for \$46 billion to AT&T Corp. Now he is back, trying to do the same thing across the Atlantic. A series of deals already made or pending . . . [would make] him the biggest cable operator there. . . . Such a role in the U. S. helped earn him the sobriquet “Darth Vader” in some quarters. “These are not investments for wimps,” Mr. Malone said in a recent interview. (Peers and Karnitschnig 2002)

8. No business school to my knowledge consciously teaches its students to be dishonest, although some school-approved marketing, accounting, and financial techniques lend themselves to dishonest use. Such pressures to bend the truth usually develop on the job as companies confront various competitive pressures or self-induced financial crises. Nevertheless, business schools that put almost exclusive emphasis on the tools of accounting, finance, marketing, economics, and quantitative analysis and who simultaneously either fail to teach business ethics or deemphasize its importance by making it an elective course produce graduates who are at a magnified risk of succumbing to on-the-job demands for unethical behavior. For a brief primer on the ethical pitfalls lurking in various accounting techniques, see a *Wall Street Journal* report on “creative accounting” by Ken Brown (2002), quoting an accounting professor who says, “That’s what creative accounting is, it’s trying to alter perceptions of business performance.”

9. Hominoid primates, especially chimpanzees and bonobos, as well as a much wider range of other species, display behavior functionally similar to actions that humans define as moral or normative, and one leading primatologist (de Waal 1996) argues that these behaviors are an evolutionary parallel to human morality. In saying that morals and values are a humanly assigned quality, I accept de Waal’s position while also maintaining that *Homo sapiens* and perhaps earlier hominid varieties have self-consciously and deliberately assigned moral meanings to the behaviors that their primate predecessors were and are able to act out only by less-than-fully-deliberative means. More recently de Waal (2001) has extended his argument that chimpanzees and bonobos manifest the kind of imitative and learned behavior that constitutes culture, a view he shares with others (Wrangham et al. 1994; Whiten and Boesch 2001).

10. The many typical variations in the values held by the individual members of any given business firm were called “X-factor values” in *Values, Nature, and Culture in the American Corporation* (Frederick 1995), with the “X” denoting the uncertain and often unknowable numbers and types of values present within the whole. The workplace diversity is a function of race, gender, age, personality type, role taken at work, religion, natal locale, ethnic marker, intelligence, education, etc.

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Appendix

Three Blind Mice: A Suggestive Analogy

Neuroscientists recently discovered the location of the retina's cells that set a person's biological clock (Blakeslee 2002). These cells let the body know when to wake up and when to go to sleep, and they operate on a twenty-four-hour schedule. This clock is reset every day as light levels change with the Earth's movement around the sun. The discovery overturns the prevailing belief that other retinal cells, called rods and cones, were resetting the circadian clock, which caused one scientist to describe the finding as "heretical."

Another said, "We thought we knew everything about the retina. Now we find we have two separate systems in the eye, one for vision and one for setting the clock. We have a new way of thinking about how light is interpreted by the nervous system."

Still another said that the traditional view of how light is handled in the eye has held for more than one hundred years. The rods and cones were supposed to perform both functions. Now a deeper understanding of the new photoreceptors might lead to novel treatments for disturbances of the body's internal clock. It may turn out that people who have defects in the newly described system could suffer from "time blindness" similar to color blindness.

I can't resist suggesting an analogy to this paper's account of the Evolutionary Firm. If it is true that business behavior is a function of ancestral neural algorithms embedded within the human brain, motivating business practitioners to economize and their companies to have a potential for symbiotic-moralizing outcomes, all within a highly charged emotive setting, then we have made a new discovery, thanks to neuroscientists and evolutionary psychologists.

Tracking the language of the scientists who discovered the eye's clock-setting cells, one might even be able to say, as they did, that we thought we knew everything about business. Now we find we have two separate but inter-related systems for understanding how business behaves. We have a new way of thinking about business motives and morals.

Moreover (continuing the analogy and paraphrasing the language used above), the traditional view of how business behaves has held for well over one hundred years. Character and culture, the managerial equivalents of those rods and cones, were supposed to contain all the answers. Now a deeper understanding of the way the human brain works might lead to novel solutions to some of the moral disturbances of the business system. It may turn out that business practitioners whose decisions are ruled by economizing and power-aggrandizing algorithms suffer a "moral blindness" similar to time blindness and color blindness. Some scholars may even believe the new way of thinking to be heretical.

It may or may not be analogically significant that the eye experiment was carried out on three blind mice, or that the findings of cognitive neuroscience and evolutionary psychology seem invisible to some people.