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SHIFTING PARADIGMS FOR SUSTAINABLE DEVELOPMENT: IMPLICATIONS FOR MANAGEMENT THEORY AND RESEARCH

THOMAS N. GLADWIN
JAMES J. KENNELLY
TARA-SHELOMITH KRAUSE
New York University

Modern management theory is constricted by a fractured epistemology, which separates humanity from nature and truth from morality. Reintegration is necessary if organizational science is to support ecologically and socially sustainable development. This article posits requisites of such development and rejects the paradigms of conventional technocentrism and antithetical ecocentrism on grounds of incongruence. A more fruitful integrative paradigm of "sustaincentrism" is then articulated, and implications for organizational science are generated as if sustainability, extended community, and our Academy mattered.

Nothing in this world is so powerful as an idea whose time has come.

Victor Hugo, 1802–1885.

Gareth Morgan warned 15 years ago that organizational scientists were "imprisoned" by a constricted range of assumptions about the ontological status of social reality and human nature and needed to embrace a more cosmopolitan outlook in theorizing in order to advance the field (1980). With some liberation, we find that the domain of organizational science is today more fragmented and diverse than ever; to borrow from Pfeffer, the "weed patch" has proliferated (1993). As we approach the 21st century, however, we sense that our weedy domain may be isolated and fractured by a profound epistemological crisis: the conceptual divi-

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sion and resultant disassociation between humankind (and its organizations) and the remainder of the natural world.

Biologist David Ehrenfeld would describe this larger confinement as the "arrogance of humanism" (1981), from which organizational science must escape. This article suggests that management theorists ponder the fundamental question of "how do we wish to live and what is the role of organizations in such living?" It asks whether the shared unwritten rules of management theory reflect an overarching anthropocentric paradigm. Are we bonded together by the taken-for-granted assumptions of dualism, inherited from the Enlightenment, that powerfully but constrictively influence what we see, how we interpret, and how we normatively direct our thinking regarding the role of human organization on earth? The article ultimately asks each of us to surface our "tacit frames" (Schön & Rein, 1994) regarding humans and (or in) nature and to confront the question of the impact of management theory and practice on the full human community, the natural environment, and a sustainable future.

The disassociation between organizational studies and the natural environment has been captured by Shrivastava with the metaphor of "castration" (1994). Attention to nonhuman nature is absent from the strategic management literature (Hosmer, 1994; Pauchant & Fortier, 1990; Throop, Starik, & Rands, 1993), from stakeholder theory (Starik, 1995), and limited in the field of business ethics (Hoffman, 1991). Indeed, a growing number of observers (Buchholz, 1993; Gladwin 1993a, b; Orr, 1994; Stead & Stead, 1992) have remarked on the paucity of attention to the biophysical world in management theory and education. Phrases such as *biosphere, environmental quality, ecosystem,* or *sustainable development* are virtually absent from the leading management journals (appearing on average in less than .003 % of the abstracts of articles contained in the ABI/Inform Database from January 1990 to January 1994).

Despite promising work emerging from scholars associated with the Academy's Organizations and Natural Environment Interest Group, most management theorizing and research continues to proceed as if organizations lack biophysical foundations. Organic and biotic limits in the natural world are excluded from the realm of organizational science. Theories employ organismic metaphors restricted to only humanly mediated transactions across organization-environment boundaries, ignoring the myriad ecosystem service transactions that ultimately keep organizations alive. Quite simply, how many organizations could exist in the absence of oxygen production, fresh water supply, or fertile soil? The disassociation intellectually disconnects organizations from the ultimate sources of life—the sun, photosynthesis, biodiversity, food chains, and biogeochemical and nutrient cycles. In a manner not dissimilar to neoclassical economics, this disassociation leads organizational theorists to employ injudicious assumptions, impossibility theorems, and fallacies of misplaced concreteness (Daly & Cobb, 1994).

The dysfunctional, and at times pathological, dangers of being

locked into "psychic prisons" (Morgan, 1986), "iron cages" (DiMaggio & Powell, 1983), and other forms of constricted sense making (Weick, 1969) or faulty mental modeling (Senge, 1990) are well known to organizational scientists. This paper provides management theorists with an opportunity for reflection and reframing (Schön & Rein, 1994). It first surveys the meaning and principal requisites of sustainable development. It appraises the conventional paradigm of *technocentrism* and its generated opposite of *ecocentrism,* and finds both deficient according to the requirements of sustainable development. A new integrative paradigm of *sustaincentrism* is then proposed as more fruitful in yielding sustainability when put into practice. The article concludes with a broad and perhaps provocative set of implications for transforming management theory and research in support of sustainable development. An unusually extensive set of references is provided, which may prove helpful to organizational scientists in navigating the transdisciplinary journey that lies ahead.

TOWARD A MEANING OF SUSTAINABLE DEVELOPMENT

Sustainable development has been variously conceived in terms of vision expression (Lee, 1993), value change (Clark, 1989), moral development (Rolston, 1994), social reorganization (Gore, 1992) or transformational process (Viederman, 1994) toward a desired future or better world. The core idea was defined most influentially by The World Commission on Environment and Development (i.e., The Brundtland Commission) as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (1987: 8). In its broadest sense, this normative abstraction has been widely accepted and endorsed by thousands of governmental, corporate, and other organizations worldwide (Gladwin & Krause, In press).

Definitions of Sustainable Development

Since the time of the Commission report, scores of alternative definitions of sustainable development, sustainable economies, and sustainable societies have been proposed. See Table 1 for an abbreviated gallery of some of the more detailed and/or leading conceptions in recent years.

A perusal of Table 1 (along with a content analysis of many other definitions of sustainable development catalogued in Gladwin, 1992; Pearce, Markandya, & Barbier, 1989; Pezzey, 1992) indicates that the construct is fundamentally infused with multiple objectives and ingredients, complex interdependencies, and considerable "moral thickness" (Williams, 1985). As a consequence, some observers forecast that the notion of sustainable development will remain fuzzy, elusive, contestable, and/or ideologically controversial for some time to come (Beckerman, 1994; Dowie, 1995; Levin, 1993). Yet definitional diversity is to be expected during the emergent phase of any potentially big idea of general usefulness; sustainability is akin to democracy, liberty, equality, or security in

TABLE 1
Representative Conceptions Of Sustainable Development

To maximize simultaneously the biological system goals (genetic diversity, resilience, biological productivity), economic system goals (satisfaction of basic needs, enhancement of equity, increasing useful goods and services), and social system goals (cultural diversity, institutional sustainability, social justice, participation) (Barbier, 1987: 103).

Improving the quality of human life while living within the carrying capacity of supporting ecosystems (The World Conservation Union, United Nations Environment Programme & Worldwide Fund for Nature, 1991: 10).

Sustainability is a relationship between dynamic human economic systems and larger dynamic, but normally slower-changing ecological systems, in which (a) human life can continue indefinitely, (b) human individuals can flourish, and (c) human cultures can develop; but in which effects of human activities remain within bounds, so as not to destroy the diversity, complexity, and function of the ecological life support system (Costanza, Daly, & Bartholomew, 1991: 8).

A sustainable society is one that can persist over generations, one that is far-seeing enough, flexible enough, and wise enough not to undermine either its physical or its social systems of support (Meadows, Meadows, & Randers, 1992: 209).

Sustainability is an economic state where the demands placed upon the environment by people and commerce can be met without reducing the capacity of the environment to provide for future generations. It can also be expressed as . . . leave the world better than you found it, take no more than you need, try not to harm life or the environment, and make amends if you do (Hawken, 1993: 139).

Our vision is of a life-sustaining earth. We are committed to the achievement of a dignified, peaceful, and equitable existence. We believe a sustainable United States will have an economy that equitably provides opportunities for satisfying livelihoods and a safe, healthy, high quality of life for current and future generations. Our nation will protect its environment, its natural resource base, and the functions and viability of natural systems on which all life depends (U.S. President's Council on Sustainable Development, 1994: 1).

Sustainability is a participatory process that creates and pursues a vision of community that respects and makes prudent use of all its resources—natural, human, human-created, social, cultural, scientific, etc. Sustainability seeks to ensure, to the degree possible, that present generations attain a high degree of economic security and can realize democracy and popular participation in control of their communities, while maintaining the integrity of the ecological systems upon which all life and all production depends, and while assuming responsibility to future generations to provide them with the where-with-all for their vision, hoping that they have the wisdom and intelligence to use what is provided in an appropriate manner (Viederman, 1994: 5).

this regard. As Kuhn noted, new paradigms tend to emerge from entirely new fundamentals and, at first, without a full set of concrete rules or standards (1962). Rather than lament or withdraw from this embryonic state of affairs, we hope that management scholars will proactively embrace the unfolding process of paradigmatic debate, for the advance of all sciences requires conflict between competing schools of thought (Kuhn, 1970).

Components of Sustainable Development

Scholars dealing with sustainability, we believe, must accept the interpenetration of observable fact and humanly assigned value, the hazy

lines between description and prescription, and the twin filters of scientific viability and policy usefulness inherent in this value-laden topic. Sustainability, in the end, may lie beyond or after the fact, in what Clifford Geertz might call the realm of "unabsolute truths" (Berreby, 1995). For now, we are forced to deal with the topic at a rather high level of abstraction. It surely will be some time before the technical characteristics, operational indicators and moral injunctions of sustainable development enjoy widespread consensus.

It is however possible to deduce some principal components of the ideas that are generally shared by a majority of recently published conceptions such as those presented in Table 1. Our own content analysis suggests that sustainable development is a process of achieving *human development* (widening or enlarging the range of people's choices; United Nations Development Programme, 1994) in an *inclusive, connected, equitable, prudent,* and *secure* manner. *Inclusiveness* implies human development over time and space. *Connectivity* entails an embrace of ecological, social, and economic interdependence. *Equity* suggests intergenerational, intragenerational, and interspecies fairness. *Prudence* connotes duties of care and prevention: technologically, scientifically, and politically. *Security* demands safety from chronic threats and protection from harmful disruption.

We accept that debate over the meaning of sustainable development will go on, and *should* go on, for a long time, and that our chosen abstract conception is but one of many that might be offered at this time. The formula is very simple, in that human development is subjected to five constraints. In this view, development is unsustainable when an enlargement of human choice excludes, disconnects, promotes inequity, reflects imprudence or raises insecurity. We recognize that all of these terms are challenging to define, with notions such as security or prudence more easily identified by their absence than their presence. Yet if the reader contemplates the representative definitions in Table 1, we believe she or he will agree that these constraints on the range of human choice represent a reasonable basis upon which to move the debate forward. Each of the five components is further amplified next.

Inclusiveness. The definitions of sustainable development presented in Table 1 share an expansive view in terms of space, time, and component parts of the manifest world. They suggest that sustainability embraces both environmental and human systems, both near and far, in both the present and the future. An understanding of the human dimensions of sustainability must encompass the "driving forces" of anthropogenic global environmental change: population change, economic growth, technological change, political and economic institutions, and attitudes and beliefs (Stern, Young, & Druckman, 1992). Sustainability thus goes beyond ecological efficiency to also include social sufficiency; it goes beyond "The Natural Step" (Robert, 1994) to include social and economic steps.

Connectivity. Sustainability demands an understanding of the world's problems as systemically interconnected and interdependent. As the World Resources Institute has concluded, "the concept of sustainable development is based on the recognition that a nation cannot reach its economic goals without also achieving social and environmental goals—that is, universal education and employment opportunity, universal health and reproductive care, equitable access to and distribution of resources, stable populations, and a sustained natural resource base" (1994: 43). Social equity and biospheric respect are required for enhanced welfare anywhere on the planet: Improved human welfare and social equity are necessary to motivate biospheric respect, and enhanced welfare and biospheric respect are needed to facilitate social equity (Gladwin, Krause, & Kennelly, 1995). Efforts aimed only toward ecological health and integrity, in the absence of efforts to alleviate poverty, stabilize population, and redistribute economic opportunity, may produce trivial results at best. Any gains may be counteracted by global ecosystem degradation and sociopolitical instability induced by the poverty-population nexus (Dasgupta, 1995).

Equity. Fair distribution of resources and property rights, both within and between generations, is a central dimension of nearly all conceptions of sustainable development. Some people place special emphasis on providing for the needs of the least advantaged in society. Few people address human obligations regarding the nonhuman world. The moral imperatives of intergenerational and intragenerational (as well as interspecies) equity cannot be found empirically; they can be found only intersubjectively. The absence of objective criteria pushes the study of sustainability toward that of a normative science where rules will be worked out over time via a competition of beliefs and moral debate. While acknowledging the vast realm of debate regarding fairness, equity and justice, the definitions in Table 1 imply that sustainability, at a minimum, means that human activities should not shift costs onto, or appropriate the property or resource rights of, other human interests, today or tomorrow, without proper compensation.

Prudence. Most definitions of sustainable development call for keeping life-supporting ecosystems and interrelated socioeconomic systems resilient, for avoiding irreversibilities, and for keeping the scale and impact of human activities within regenerative and carrying capacities. Most analysts call for prudence and humility in the pursuit of sustainable development, given the massive uncertainty and unpredictability, nonlinear interaction between system components, unknown thresholds, and complex dynamics in ecological and social systems (Costanza, Wainger, Folke, & Mäler, 1993). This constraint demands precaution, preemptive safeguards, reversible actions, safety margins, and preparation for perpetual surprise (Ludwig, Hilbron, & Walters, 1993).

Security. Sustainable development is generically a human-centered construct, aimed at ensuring "a safe, healthy, high quality of life for

current and future generations" (U.S. President's Council on Sustainable Development, 1994: 1). There are a number of overlapping boundary conditions that must be fulfilled in support of this goal. At a minimum, sustainability mandates *no net loss* of (a) *ecosystem and social system health* (i.e., capacities of natural and social systems to resiliently provide essential life-support services to humanity) (Costanza, Norton, & Haskell, 1992); (b) *critical natural capital* (i.e., stocks of irreplaceable natural assets such as biological diversity, the ozone layer, and biogeochemical cycles) (Daly, 1994); (c) *self-organization* (i.e., capacities of living systems to carry out self-renewal, self-maintenance and self-transformation, which provide the context for all human activity) (Norton, 1991); (d) *carrying capacity* (i.e., long-run capacities of biophysical and social systems to support physical scales of human enterprise) (Daily & Ehrlich, 1992); and (e) *human freedom* (i.e., civil society, with democracy and full realization of human rights in day-to-day living dependent on participation, accountability, reciprocity and transparency) (Veiderman, 1994), including the fulfillment of basic human needs.

APPRAISING PARADIGMS VERSUS SUSTAINABLE DEVELOPMENT

> *Men and women become civilized, not in proportion to their willingness to believe, but in proportion to their readiness to doubt.*
>
> Henry Louis Mencken, 1880–1956.

We will dialectically examine three worldviews or paradigms next: the conventional *technocentric* worldview (thesis) versus its generated opposite, the alternative *ecocentric* worldview (antithesis), versus a potential new emergence or higher union in the sense of an integrated *sustaincentric* worldview (synthesis).

Worldviews refer to "the constellations of beliefs, values and concepts that give shape and meaning to the world a person experiences and acts within" (Norton, 1991: 75). They rarely take the form of highly developed systematic philosophies, typically remaining sets of background assumptions that *tend* to organize language, thoughts, perceptions, and actions (Morgan, 1980; Schön & Rein, 1994). Sets of background assumptions about how the world works are usually incomplete or fragmented, and often they are not even recognized or appreciated by their holders. Numerous forces, however, work to consciously and/or unconsciously cohere the central or formative axioms of a worldview, through norm secretion, filtering, structuration, legitimation, anchoring, injunction, and so on (Kuhn, 1962; Norton, 1991). Such self-reinforcement helps explain why worldviews are so resistant to change and why paradigm shifts take so long to gain full acceptance.

The alienated poles of technocentrism and ecocentrism have long been the subject of attention in a variety of disciplines that have examined

the human-environment relationship, including economics (Daly, 1994; Turner, 1993), sociology (Catton & Dunlap, 1980; Redclift & Benton, 1994), philosophy (Naess & Rothenberg, 1989; Sessions, 1995), political science (Eckersley, 1992; Milbrath, 1989), psychology (Buss & Craik, 1983; Wilber, 1995), feminism (Eisler, 1987; Merchant, 1992) and systems theory (Capra, 1982; Henderson, 1991). Technocentrism has variously been labeled cornucopianism, expansionism, growthmania, shallow environmentalism, or weak sustainability, whereas ecocentrism has been referred to as neomalthusianism, preservation, steady stateness, deep ecology, or strong sustainability.

Our typology integrates and extends this prior work to construct alternate worldviews based on comprehensive sets of shared fundamental assumptions. The three sets are not closed or monolithic. They merely represent broad camps in which many schools of thought and subtle variations flourish. Given that worldviews in practice are typically taken for granted, it is reasonable to expect that no one person or institution would strictly hold to all of the assumptions within any one worldview. Human and organizational mindsets may very well mix assumptions from the different camps in a variety of complex, conflicting, and ill-defined ways. Our trichotomy is thus simply schematic, not photorealistic. However, we believe it is heuristically useful, because so much of the environmental and sustainability debate has been framed in terms of technocentrism versus ecocentrism (Shrivastava, 1995). Little theoretical progress can be made regarding the nature of sustainable enterprise on unquestioned grounds. The underlying assumptions about the world in which it is to exist must be surfaced and confronted.

Epistemologically, our concern is not that of correctness; no given worldview is either right or wrong. We contend that traditional validity claims of truthfulness, rightness, or aesthetic judgment are unlikely to be useful or convincing in evaluating alternate worldviews in relation to sustainable development at this time. Validation on the basis of empirical-scientific truths would be difficult because the worldview of technocentrism has had a lengthy opportunity to become established in our collective psyches, whereas ecocentrism and "sustaincentrism" remain basically hypothetical. How could a person definitely establish normative rightness when the just distribution of resources or rights within and across both generations and species has been the subject of continuing debate? How could a person expect scholars steeped in positivistic-empirical-normal science to be persuaded by validity appeals based upon subjective truthfulness, elegance of argument, or aesthetic judgment?

We cannot proclaim, therefore, that either technocentrism, ecocentrism, or sustaincentrism are true or false, good or evil, beautiful or ugly. We can, however, posit a criterion of relative fitness, congruence, or fruitfulness by which a set of paradigmatic assumptions is most likely to yield sustainable development when put into practice. In other words, which

set of assumptions is most consistent with our prescriptions for inclusiveness, connectivity, equity, prudence, and security?

We are cognizant of potential criticisms of our argument, objecting that we are using the components of sustainable development in defense of a worldview that supports it. However, because the criteria for choice always function as values, there is no neutral algorithm that could conclusively prove the correctness of an alternative paradigm (Kuhn, 1970). We are left arguing from the lens of our own paradigmatic frame. Readers are free to dismiss the goal of sustainable development, our component conceptualization of it, and our subsequent argumentation for it. Paradigmatic struggles cannot be settled by logic or experiment alone (Cannella & Paetzold, 1994). Our argument is reduced, in the absence of inherent truth, rightness, or beauty, to one of coherent persuasiveness. It can be reduced to elemental questions: How do we wish to live? What is the human quality of humankind and the natural quality of nature that is to be preserved? (Beck, 1992: 28). This, the reader must decide. Following is an articulation of the three paradigms.

The Technocentric Paradigm

The origins of the technocentric paradigm can be traced back to the Scientific Revolution of the 17th century, the emergence of liberal social theory and "invisible hand" reasoning, and the bias toward human dominion over nature that some see embedded in Western religion (Capra, 1982; Daly & Cobb, 1994; Gore, 1992; Merchant, 1992; Orr, 1992). The technocentric worldview is dominant today, we believe, in mainstream elements of business, and in its professional academies. It is typically taken for granted in most conventional economic and management journals and textbooks and expressed most forcefully by authors such as Bailey, 1993, Ray and Guzzo, 1993, Simon, 1981, Simon and Kahn, 1984, and Myers and Simon, 1994: Technocentrism's apparent fundamental assumptions (summarized in Table 2) follow.

Technocentric ontology and ethics. The earth is inert and passive and therefore legitimately exploitable. Nature is composed of infinitely divisible objects, moved by external rather than internal forces, existing within a field of discrete events. The dominant metaphor is mechanical, with the whole nothing more than the sum of its parts. Given atomistic individualism, understanding is achievable via reductionist, monological and positivistic modes of reasoning. System structure is hierarchical, and isolated and individual wholes are arranged in a graded fashion.

Humankind is separate from and superior to nature. Humans are the only locus of intrinsic value. They have a right to master natural creation for human benefit. The objectified natural world thus has only instrumental and typically monetarily quantifiable value as a commodity. Ethics are narrowly homocentric and utilitarian, because contemporary and proximate human beings matter most. Sacrifices on behalf of future generations, nonhuman nature or distantly less fortunate current generations

TABLE 2
Alternative Environmental Paradigms

Key Assumptions	Technocentrism	Sustaincentrism	Ecocentrism
	A. Ontological & Ethical		
1. Metaphor of earth	Vast machine	Life support system	Mother/web of life
2. Perception of earth	Dead/passive	Home/managed	Alive/sensitive
3. System composition	Atomistic/parts	Parts and wholes	Organic/wholes
4. System structure	Hierarchical	Holarchical	Heterarchical
5. Humans and nature	Disassociation	Interdependence	Indisassociation
6. Human role	Domination	Stewardship	Plain member
7. Value of nature	Anthropocentrism	Inherentism	Intrinsicalism
8. Ethical grounding	Narrow homocentric	Broad homocentric	Whole earth
9. Time/space scales	Short/near	Multiscale	Indefinite
10. Logic/reason	Egoist-rational	Vision/network	Holism/spiritualism
	B. Scientific & Technological		
1. Resilience of nature	Tough/robust	Varied/fragile	Highly vulnerable
2. Carrying capacity limits	No limits	Approaching	Already exceed
3. Population size	No problem	Stabilize soon	Freeze/reduce
4. Growth pattern	Exponential	Logistic	Hyperbolic
5. Severity of problems	Trivial	Consequential	Catastrophic
6. Urgency of solutions	Little/wait	Great/decades	Extraordinary/now
7. Risk orientation	Risk taking	Precaution	Risk aversion
8. Faith in technology	Optimism	Skepticism	Pessimism
9. Technological pathways	Big/centralized	Benign/decoupled	Small/decentralized
10. Human vs. natural capital	Full substitutes	Partial substitutes	Complements
	C. Economic & Psychological		
1. Primary objective	Efficient allocation	Quality of life	Ecological integrity
2. The good life	Materialism	Postmaterialism	Antimaterialism
3. Human nature	Homo economicus	Homo sapient	Homo animalist
4. Economic structure	Free market	Green economy	Steady state
5. Role of growth	Good/necessary	Mixed/modify	Bad/eliminate
6. Poverty alleviation	Growth trickle	Equal opportunity	Redistribution
7. Natural capital	Exploit/convert	Conserve/maintain	Enhance/expand
8. Discount rate	High/normal	Low/complement	Zero/inappropriate
9. Trade orientation	Global	National	Bioregional
10. Political structure	Centralized	Devolved	Decentralized

are generally unwarranted, unless market signals dictate otherwise. Assuming continued economic growth and technological innovation, today's generation need only pass on to the next an aggregate capital stock no less than the one enjoyed currently. Reasoning is egoistic, linear, instrumental and rational.

Technocentric science and technology. Nature is tough and resilient in the face of disturbance, and damage is generally reversible. Nature changes gradually, fast enough to be detected, yet slow enough to be controlled. The earth's physical resources are virtually inexhaustible because of infinite human ingenuity in exploiting them or in finding substitutes for emergent shortages. Population growth is a positive force for improvement rather than a driving force of environmental degradation, for it sparks creativity and ingenuity within societies (Simon 1981). Smooth exponential growth is the norm and not a consequential problem.

There is no cause for undue alarm or drastic action, because

environmental dangers are greatly exaggerated (Easterbrook, 1995). The correct environmental management strategy is to put science first. There is plenty of time to improve scientific understanding, and in the absence of full certainty, costly measures to prevent potentially serious or irreversible harm should be postponed for the sake of cost/benefit efficiency. Humans are sufficiently wise and far-seeing to manage any technology (e.g., nuclear energy, genetic engineering or nanotechnology) safely and free of corruption. Different forms of capital are nearly perfectly substitutable, implying that the current generation may run down and pass on less natural capital so long as it assures, by substitution and investment, offsetting increases in the stock of physical and human capital so as to generate equivalent levels of well-being.

Technocentric economics and psychology. The economy is a closed linear system, isolated from nature, where exchange value circulates between industries and households. All else is exogenous. The primary economic objective is to efficiently allocate resources. Human wants are central and unlimited; a secular-material view of the good life dominates. Individuals behave in a self-interested and consistent manner to maximize their utility. The optimal economic structure for satisfying wants and allocating resources most efficiently is laissez-faire capitalism. Goods and services are allocated to the most valued ends based upon the willingness to pay. Externalities arising from market failures should be internalized if cost effective (i.e., if gains in social welfare from correcting the externality outweigh the costs of doing so).

The world is largely empty. Growth is good, and more growth is better; growth enables governments to tax and raise resources for environmental protection and leads to less polluting industries and adoption of cleaner technologies. Global growth and its trickle-down benefits are the key to alleviating poverty, bettering the lives of the poor without sacrifices by the rich. Free or unregulated trade increases economic efficiency through comparative advantage. Global economic integration and free mobility of capital across national borders maximize welfare. With nearly infinite substitution possibilities, scarcity is relative rather than absolute. The future can thus be discounted at conventional rates because people universally exhibit short-term time preference, and rates of productivity of natural and human-made capital are likely to increase through time.

Appraising technocentrism versus sustainability. We proposed earlier that for a worldview to be congruent with sustainable development it must manifest inclusiveness, connectivity, equity, prudence, and security. The technocentric worldview, in our opinion, performs poorly on all five tests.

Inclusiveness. Technocentrism disassociates the human economy from nonhuman nature. It disregards a broad range of scientific understandings regarding thermodynamic limits on resource availability, irreversibilities associated with losses of critical natural capital, biophysical

interdependence between human capital and natural capital, and the finite, nongrowing, materially closed character of the global ecosystem (Jansson, Hammer, Folke, & Costanza, 1994). Its overarching economic efficiency calculus represses attention to matters of appropriate ecological scale and fair distribution of resources and property rights. Its exclusive reliance on markets subordinates concern with community, nature, the poor, marginalized segments of society, including women and minorities, and the interests of future generations.

Connectivity. Technocentrism may be a fractured worldview that "drastically separates mind and body, subject and object, culture and nature, thoughts and things, values and facts, spirit and matter, human and nonhuman" (Wilber, 1995: 4). Such dualism and gross reductionism sever the connections and complex interlinkages at the crux of the sustainability challenge.

Equity. Technocentrism is viewed as "arrogantly" human centered (Ehrenfeld, 1981). Ecofeminists see it as a pathological domination logic of men over both women and nature (Warren, 1994). Many development and environmental economists see technocentrism's logic of growth via market mechanisms as variously perpetuating poverty and underdevelopment, deepening economic and social disparities, giving privileges to a wealthy minority at the expense of the human majority, exhausting and dispersing a one-time inheritance of natural capital, reducing the rights of future generations, legitimating the concentration of economic and political power, and separating control of productive assets from the communities that depend on them (Daly & Cobb, 1994; Ehrlich, 1994; Korten, 1990; Maclean, 1990; Sen, 1982; Weiss, 1989).

Prudence. The core economic and technological assumptions of technocentrism are rather dangerous, we believe, given large uncertainty and complexity. Technocentrism's heavy discounting of the future, by which distant catastrophic consequences become virtually irrelevant in the short-term present, also biases policies toward inaction. Continuing with technocentrism as usual may, quite simply, represent a huge gamble with survival.

Security. Although it is unfair to trace all world problems to technocentrism's doorstep, it is clearly correlated with a world "in agony" (Council for a Parliament of the World's Religions, 1994: 67). Evidence of declining renewable resources, persistent pollution, and a threatened biological base are well documented (Ayres, 1993; Vitousek, 1994; World Resources Institute, 1994). Even within developed countries, most important environmental indicators remain negative, and trends are not improving (Scharf & Williamson, 1994). In the social realm, data clearly suggest persistent deprivation for the human majority, widening disparities within and between nations, and gathering forces of social decomposition and divisiveness posing threats to human security (Gladwin, Krause, & Kennelly, 1995; United Nations Development Programme, 1994).

In summary, technocentrism fails, in our view, the litmus tests of

sustainability. It pathologically disassociates or represses many critical components bearing upon life-support systems. It fractures or severs the connections that sustainability requires. It fails to deal adequately with intergenerational, intragenerational and interspecies equity. It hubristically places an extremely large and risky wager on the future. Finally, although it produces material wealth and power for a privileged minority, it gives rise to risks and imbalances that threaten the future of the entire human community. If society does indeed adopt sustainable development as a fundamental organizing principle (Gore, 1992), then the dominant paradigm of technocentrism will clearly become a paradigm in crisis. From a dialectical perspective, technocentrism contains profound contradictions. These inconsistencies are simultaneously paradigm destructive and paradigm reconstructive, and thus they are conducive to reexamination.

The Ecocentric Paradigm

Supporters of the ecocentric worldview variously draw philosophical inspiration from Eastern philosophies based on conformance with the critical order of nature, indigenous reverence for life-giving earth, transcendental and preservationist movements, the "land ethic" of conservationist Aldo Leopold (1949), the deep ecology movement that rejects human domination over nature (Devall & Sessions, 1985; Sessions, 1995), and new age systems thinking (Capra, 1982; Jantsch, 1980).

Ecocentrism tends to be evident in the belief systems of animal-rights activists, spiritual ecofeminists, restoration ecologists, organic farmers, bioregionalists, steady-state economists, followers of the Gaia hypothesis (Lovelock, 1988), and more radical environmental activists. It is expressed in contemporary texts by authors such as Callicott, 1989, Goldsmith, 1993, Merchant, 1992, Naess & Rothenberg, 1989, Swimme & Berry, 1992, and Snyder, 1990. Its core assumptions (see Table 2) follow.

Ecocentric ontology and ethics. The earth is the nurturing mother of life, a great interlocking order, and a web of life in which humans are but one strand. The earth is alive, active, sensitive to human action, and sacred. The governing metaphor is organic, with wholeness representing the basic principle of ecocentrism. Everything is connected to everything else, and internal relations and process take primacy over parts. System structure is extremely heterarchical, established by an egalitarian interplay of interconnected parts. Humans are both ontologically and phylogenetically unseparated from the rest of nature.

According to ecocentrism, the premise that humans occupy a privileged place in nature is rejected. Nonhuman nature has intrinsic value, independent of human values and human consciousness, which places limits on the extent of human prerogatives to use and alter it. Nonhuman nature should be used by humans only to satisfy vital needs of sustenance. Noninterference in naturally evolving systems is a primary moral

duty. Ethical priority is given to wholes over parts: "a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold, 1949: 224–225). Time and space scales are multilevel and intertemporal.

Ecocentric science and technology. Nature is fragile, easily stressed, and vulnerable. Damage to human interests is essentially irreversible in cases of biodiversity and topsoil loss, groundwater depletion, and interference with biogeochemical cycles. The current human population size and its material demands already exceed the long-term biophysical carrying capacity of the planet; the optimum human population is in the vicinity of 1.5 to 2 billion people (Daily, Ehrlich, & Ehrlich, 1994). The flourishing of nonhuman life requires a substantial decrease in the human population.

Humanity and the natural world are on a collision course, which will result in global decay and chaos in the absence of urgent and radical reform (Kaplan, 1994). This hyperbolic view of fundamental instability correlates with high-risk aversion and pessimism regarding human capacities to generate and use technology wisely. Technology is viewed as a Faustian bargain, trading current gain against future survival. Persistence is only feasible via small, simple, resilient, and decentralized systems and technologies that make minimal demands on nature. Such pathways are necessary because manmade capital and natural capital are fundamentally complements, rather than substitutes, in most production functions. Virtually all production and welfare are totally dependent on ecological health, integrity, and abundance. Technological substitutes are not plausible for most critical nonrenewable natural resources and life-support functions.

Ecocentric economics and psychology. Human well-being is a derivative function, secondary to the well-being of the earth (Swimme & Berry, 1992). Ideal human nature is based on full immersion into the biosphere (Naess, 1995). Because the world is already full, material growth increases environmental and social costs faster than benefits of production and consumption. Ultimately, growth makes humanity and the rest of nature poorer, not richer. Economic order implies more ecological disorder. Given that the scale of material and energy throughput must be drastically reduced, a minimalist development strategy is needed. The good life resides in voluntary simplicity.

The achievement of human security, dignity, and satisfaction can be reached through steady-state economics (Daly, 1992), material sufficiency, and biospherical equality. Poverty can be dealt with via redistribution of wealth. Natural capital must be preserved and enhanced. This axiom necessitates drastically reduced rates of energy and matter throughput across ecosystem-economy boundaries. If ecologically optimal scale is the overarching objective, collective decisions override the free play of market forces. Because uncontrolled capital mobility reduces economic security and ecological integrity, capital must be rooted in

community, and trade must be restricted to the exchange of true ecological surpluses. Small-scale community-based economies defined by natural regional boundaries (bioregionalism) are most appropriate. Finally, the tyranny of discounting against the future fosters exhaustion of natural capital and must be overcome.

Appraising ecocentrism versus sustainability. In reacting to technocentrism, ecocentrists offer a worldview that is more holistic, integrative, and less arrogantly anthropocentric. Ecocentrism, however, also fails our litmus tests of sustainable development.

Inclusiveness. Ecocentrism emphasizes harmony in nature and downplays its harshness. The full range of human ecological needs in such roles as predator, prey, competitor, and symbiont (Grizzle, 1994) is often downplayed. As a species in a biotic community, some mix of human subduing and caring is essential; as Nash stated, "some degree of domination of nature *by* humans is necessary to prevent the domination of humans *by* nature" (1991: 106).

Ecocentrism subordinates humans to the biosphere. Although true in the physical and ecological spheres, it is an ontological fallacy to claim that the human intellect is subservient to the biosphere (Wilber, 1995). Ecocentrism dispenses with human distinctiveness and, thus, with human centrality in a hierarchically evolving universe (Weinberg, 1994). It ultimately removes the wisdom from Homo sapiens. Ecocentrism overcomes the gross reductionism of technocentrism, but it covertly propagates a subtle reductionism by instrumentalizing everything in its holistic web of life ideology. Ecocentrism fails to embrace the capacity of human intellect and, thus, the whole of reality.

Connectivity. A renowned proponent of deep ecology recently expressed the opinion that pursuit of ecological sustainability would be acceptable, regardless of the state of affairs in the domains of peace and justice (Naess, 1995). This view falls considerably short of our argument that ecological sustainability is a necessary, but not sufficient, condition for sustainable development. Ecological sustainability is simply unachievable under conditions of social or economic unsustainability. Ecocentrism offers little guidance concerning the horrors of expanding poverty, human-rights abuse and massive displacement that currently beset much of the developing world. It fails to adequately address issues of unemployment, income inequality, and other social pathologies that grip the industrial world. Ecocentrism does not ensure sustainable livelihoods.

Equity. Ecocentrism privileges the biosphere, levels distinctions within it, and by emphasizing the whole, depreciates the importance of the suffering of individual parts (human or nonhuman). Even though most ecocentrists have offered biospheric egalitarianism as a supplement or complement, and not a substitute, for human-to-human morality (Callicott, 1989), more extreme ecocentrism evokes accusations of antihumanist cosmology, misanthropy, or even fascism (Wolfe, 1991). Although we will

not attempt to settle this debate here, it is important to note that an ethic that gives nonhomocentric guidance is still impeded by uncertainties as to the constraints and ground rules by which a moral theory must abide (Stone, 1993). In the absence of principles for adjudicating conflicts of interest between human and nonhuman nature, ecocentrism offers little policy guidance beyond that of taking all legitimate human and nonhuman interests into account in decision making (Norton, 1989). Ecocentrism may completely paralyze pragmatic action of any sort.

Prudence. Ecocentrism eulogizes a primal state when matter, life, and mind were undifferentiated and whole (Goldsmith, 1993; Roszak, 1992). It is a vision of return to a pristine communion with nature in a new Golden Age. The reality today, however, is that humans already may have brought about "the end of nature" as a force independent of humanity (McKibben, 1989). Human alteration of natural cycles and land use/land cover is already so vast that "any clear dichotomy between pristine ecosystems and human-altered areas that may have existed in the past has vanished" (Vitousek, 1994: 1861). There is no longer a primal relationship to which to return. Projections suggest that the human population will double in the next century (World Resources Institute, 1994). According to ecocentrism, a substantial decrease of the human population from current levels is required. How this can be achieved in the absence of profound social reengineering is difficult to imagine.

Security. The United Nations Development Programme has emphasized that "it will not be possible for the community of nations to achieve any of its goals—not peace, not environmental protection, not human rights or democratization, not fertility reduction, not social integration—except in the context of sustainable development that leads to human security" (1994: 1). In our view, ecocentrism as articulated so far offers little guidance as to how the achievement of ecological sustainability is possible under current social conditions, without a gross diminishment of universal pluralism, altruism, and freedom (Taylor, 1989).

In summary, ecocentrism diminishes human distinctiveness, ignores fundamental relationships bearing upon human security and therefore ecological integrity, and rests on philosophical grounds that cannot currently be accepted as practical guides to human conduct. Despite its perhaps attractive ideology and admirable intent, ecocentrism, like technocentrism, is beset by internal contradictions and fails to truly integrate culture and nature. It is to this integrative perspective that we now turn.

The Sustaincentric Paradigm

We have argued that neither technocentrism nor ecocentrism appears to offer a basis upon which sustainable development can be achieved. Both paradigms, by setting in motion self-defeating counterforces, fail to promote development or to conserve nature. As competing paradigms, they appear locked in a state of mutual contempt and negation (Myers &

Simon, 1994). The notion of a paradigm centered on sustainable development can be understood as a dialectical outgrowth of this colossal struggle.

The sustaincentric paradigm represents an emergent synthesis, an attempt at a higher and deeper integration that we hope can unfold more and enfold more. Although technocentrism and ecocentrism have long histories, the paradigm of sustainability is embryonic. While many scholars are working to "green" technocentrism, a complete reconciliation of the two opposing paradigms remains elusive. The task is extraordinary and perhaps impossible, for modernity has so radically differentiated and pathologically disassociated matter, life, and mind (Wilber, 1995). The articulation of a sustaincentric worldview described in the following section, must of necessity be seen as a tentative, preanalytic step in the search for reconciliation.

Sustaincentrism draws its inspiration from claims of the universalism of life, the stewardship admonitions common to the major religions, the field of ecological economics (Costanza, 1991), traditions of conservationism and scientific resource management (Norton, 1991), and emerging scientific theories based on nature's dynamic complexity and inherent self-organizing properties (Botkin, 1990; Prigogine & Stengers, 1984; Wheatley, 1992). Current proponents of sustaincentrism include many environmental groups, social action groups, think tanks, the U.S. National Academy of Sciences, and the United Nations. Nascent efforts endeavoring to sort out its emergent dimensions and principles can be found in many works (Brown et al., 1994; Daly & Cobb, 1994; Gladwin, 1992; Gladwin & Krause, In press; Gore, 1992; Jansson et al., 1994; Korten, 1990; Porritt, 1991; Stead & Stead, 1992). The core assumptions tending to unite such work follow (see Table 2).

Sustaincentric ontology and ethics. The earth is humanity's home, to be kept clean, healthy, and properly managed for the sake of human survival and welfare. There are no wholes and no parts anywhere in the universe; there are only "holons" (i.e., whole/parts). The nested holons within this multilevel "holoarchy" change at varied rates, communicating with each other in both an upward and downward fashion. Economic and human activities are inextricably linked with natural systems. Because dynamism and cyclicality are fundamental, synthetic, nonlinear, and intuitive modes of understanding are required.

Humans are neither totally disengaged from nor totally immersed in the rest of nature. Although they are part of the biosphere in organic and ecological terms, humans are above the biosphere in intellectual terms. The biosphere is more fundamental for existence than humans, yet humans are more significant than the biosphere because they embrace a much deeper and greater wholeness (Wilber, 1995). The crucial consequence is that humans "have become, by the power of a glorious evolutionary accident called intelligence, the stewards of life's continuity on

earth. We did not ask for this role, but we cannot abjure it. We may not be suited for it, but here we are" (Stephan Jay Gould, cited in Calvin, 1994: 107).

According to sustaincentrism, the moral monism of both technocentrism and ecocentrism is rejected in favor of moral pluralism. Ethics are broadly homocentric, grounded in the good of both human and nonhuman nature. Sustaincentric ethics actively embrace the full conceptualization of political, civil, social, economic, and cultural human rights. Inherentism guides interspecific ethics (i.e., the human consciousness is the repository of all value in human nature), but some of this value is not derivative or dependent on instrumental human values (Norton, 1991). Just as a parent might value a child, not only instrumentally but also inherently, the same can and should apply between humans and other species. Intergenerationally, a chain of moral obligation stretches across time (Howarth, 1992), and current generations are obligated not to reduce the liberties, opportunities, or welfare-generating potentials available to future generations to levels below those enjoyed at present (Weiss, 1989). Intragenerationally, current generations are obligated to ensure equitable opportunities for all of humanity, most especially the satisfaction of vital basic needs of the marginalized, poor, and most vulnerable segments of society.

Sustaincentric science and technology. The extent to which natural systems can absorb and equilibrate human-caused disruptions in their autonomous processes varies widely (Norton, 1991). The global ecosystem is finite, nongrowing, materially closed, vulnerable to human interference, and limited in its regenerative and assimilative capacities. Some natural limits are indeed being approached, particularly regarding the maximum amount of food that the earth's soil, water, and crops can produce (Brown & Kane, 1994). The scale of material and energy throughput must be limited to levels, which are admittedly difficult to specify (Botkin, 1990), below which deterioration of natural systems may not occur.

Such concerns lead to the generation of crude and difficult-to-operationalize axioms such as waste emissions should not exceed natural assimilative capacity, harvest rates for renewable resources should not exceed natural regeneration rates, and human activities should result in no net loss of genetic, species, or ecosystem diversity (Costanza & Daly, 1992; Daly, 1990; Gladwin, 1992; Hawken, 1993; Robert, 1994). A tentative set of operational principles and associated techniques of biophysically sustainable behavior is presented in Table 3. We will return to the immense challenge of operationalizing sustainability later in this article.

According to sustaincentrism, population size must be stabilized soon through the comprehensive participation and equity of women in development. Consumption in developed countries must be scaled down in order to maintain the integrity of both natural and social life-support systems. The challenge is one of logistic growth, managing a difficult socioeconomic and environmental transition to a sustainable plateau

TABLE 3
Operational Principles and Techniques of Biophysically Sustainable Behavior

Sustainability Principles	Operational Principles	Sample Techniques
Assimilation	Waste emissions ≤ Natural assimilative capacity	Pollution prevention Natural products Detoxification Biodegradability Low input agriculture Synthetic reduction
Regeneration	Renewable harvest rate ≤ Natural regeneration rate	Sustained yield management Safe minimum standards Harvest certification Access restriction Exclusive harvest zones Resource right systems
Diversification	Biodiversity loss ≤ Biodiversity preservation	Biosphere reserves Extractive reserves Buffer zones Polyculture farming Ecotourism Debt for nature swaps
Restoration	Ecosystem damage ≤ Ecosystem rehabilitation	Reforestation Mine reclamation Site decontamination Bioremediation Species reintroduction Habitat restoration
Conservation	Energy-matter throughput per unit of output (time 2) ≤ Energy-matter throughput per unit of output (time 1)	Fuel efficiency Mass transit Cogeneration Computer controls Demand side management Smart buildings
Dissipation	Energy-matter throughput (time 2) ≤ Energy-matter throughput (time 1)	Depackaging Durable design Repair/reconditioning Telecommuting Bioregional sourcing Dematerialization
Perpetuation	Nonrenewable resource depletion ≤ Renewable resource substitution	Solar energy Wind power Hydrogen fuel Bioenergy Hydropower Geothermal energy
Circulation	Virgin ÷ recycled material use (time 2) ≤ Virgin ÷ recycled material use (time 1)	Closed-loop manufacturing Industrial ecosystems Internal recycling Waste recovery Design for disassembly Water recirculation

(Holling, 1994). Problems are grave and urgent, and the Union of Concerned Scientists warned that "no more than one or a few decades remain before the chance to avert the threats we now confront will be lost and the prospects for humanity immeasurably diminished" (1992: 1).

In the face of threats of serious or irreversible damage, requirements for scientific certainty cannot be used as a reason to postpone measures to prevent environmental degradation. Precautionary principles (O'Riordan, 1995) and safe-minimum standards (Ciriacy-Wantrup, 1963) are needed to minimize irreversible losses of renewable resources, provide ecological "slack," and shift the burden of proof from the victims to the nature alterers. Proponents of sustaincentrism are not antitechnology, but they also do not accept it uncritically. Technologies should be developed and employed in appropriate, just, and humane ways. Stringent ecological, social, and economic impact assessments should be made of new technologies before they are introduced, in order to minimize adverse side effects.

Sustaincentric economics and psychology. The economic system that provides humanity with its material goods is underpinned by ecological systems; changes in one affect the other. Humans are capable of learning and appreciating the full range of aesthetic, economic, and other values residing in nature, including the primary value of aggregate life-support services provided by the entire natural system itself (Rolston, 1994). Elements of *homohonoris* (self-respect and peer approval) mix with the resourceful, evaluative, and maximizing nature of human behavior to yield wisdom. Humans can learn to satisfy nonmaterial needs in nonmaterial ways and to reduce preoccupation with material, rather than intellectual or spiritual concerns.

A prosperous economy depends on a healthy ecology, and vice versa. A green and equitable economy is possible, in which ecological and social externalities are internalized. In such a case, markets are required to efficiently allocate resources, but other policy instruments and economic incentives are required to place preemptive constraints on the pursuit of purely market criteria bearing upon natural resource use and satisfaction of basic human needs. Taxation and other public policies are shifted to favor labor intensity over capital intensity and to promote income and saving versus energy/matter throughput. Poverty reduction in sustaincentrism depends on "two equally important elements. The first element is to promote the productive use of the poor's most abundant asset—labor. It calls for policies that harness market incentives, social and political institutions, infrastructure, and technology to that end. The second is to provide basic social services to the poor. Primary health care, family planning, nutrition, and primary education are especially important. The two elements are mutually reinforcing; one without the other is not sufficient" (World Bank, 1990: 3).

The sustaincentric paradigm accepts that material and energy growth are bounded by ecological and entropic limits; growth cannot go

on forever in a closed system. Accordingly, the benefits of prior growth have not been distributed equally; the richest 20% of the population on the earth possess 83% of its financial wealth (up from 70% in 1960) and consume an estimated 80% of the world's resources (United Nations Development Programme, 1994). Resource consumption in developed countries must be reduced, but least developed nations need transitional opportunities for material growth in order to help alleviate poverty and stabilize population. There is a recognition that trade may spatially separate the costs from the benefits of environmental and labor exploitation. Uncontrolled capital mobility may work to lower workers' remuneration and environmental health and safety standards. Sustaincentrism calls for the removal of any ecological, economic, and social inequities associated with international commerce.

Portions of the natural capital stock are deemed nonsubstitutable by manmade alternatives, for example, irreplaceable genetic or species biodiversity and the ozone layer. Sustaincentrism calls for such critical natural capital to remain intact or preserved via preemptive constraints. Other less critical natural capital, however, can be converted into manmade capital possessing equivalent welfare-generating capacity. Given the public-goods character of natural capital preservation and maintenance, social rates of time preference (low or close to zero discount rates) are likely to be most appropriate for intergenerational analysis; the maximization of present value should be subject to a constraint that future generations are not made worse off.

Appraising sustaincentrism versus sustainability. Sustaincentrism offers a vision of development which is both people centered (concentrating on improvement in the human condition) and conservation based (maintaining the variety and integrity of nonhuman nature). Similar to ecocentrism, it is a paradigm not yet manifest in reality, and it can be similarly challenged on grounds of hyperidealism. Expectedly, sustaincentrism has been attacked by both technocentrists (Taylor, 1994) and by ecocentrists (Sachs, 1995). Some people might claim that as an expression of ecological humanism, it is fundamentally a contradiction in terms. We believe, however, that sustaincentrism represents the perspective that is most congruent with the requirements of sustainable development.

Inclusiveness. The sustaincentric paradigm allows the interests of today and tomorrow, of rich and poor, of North and South to acquire fuller and deeper attention. Greater balance is sought within the "3-E" triad of sustainable development: economy, ecology, and ethics. Whereas ecocentrism biases the triangle toward ecology and rights of nature, and technocentrism biases it toward the economy and market-based rights, sustaincentrism attempts to transcend these two with a more pluralist and greater embrace of the world. However, this comprehensiveness naturally adds a bewildering amount of detail complexity with which human institutions may be unable to cope.

Connectivity. Sustaincentrism also adds dynamic complexity, focusing

on interrelationships of causality, such as among poverty, population, gender bias, overconsumption, and ecosystem degradation. It shifts awareness to the human actors and their organizations and the reinforcing and balancing feedback processes that have an impact on sustainability (Senge, 1990). Researchers can obviously question whether humans and their institutions are capable of such systemic thinking. They also can ask questions about who is to do the connecting, at what levels, and over what timeframes.

Justice. Sustaincentrism advocates recognize that all human values depend on a healthy ecological, social, and economic context. They seek a hierarchically organized and integrated system of values (Norton, 1991) to guide practical action by differentiating grades of both instrumental and intrinsic value, while proposing that all living things have value independent of their usefulness to human purposes (Birch & Cobb, 1981). Ecocentric critics claim that moral pluralism inevitably implies moral chaos (see Callicott, 1989). Other skeptics question whether principled positions can be worked out in relation to the noninstrumental dimensions of sustainability, given difficult questions about the limits of moral obligation, boundaries of moral considerability, and inevitable trade-offs (Owens, 1994).

Prudence. Sustaincentrism embodies the precautionary principle and urges humility in the face of irreducible uncertainty and complexity in ecological and human systems. It assumes the ability of human knowledge and institutions to reveal limits and thresholds, determine carrying capacities, and pinpoint stress and collapse, such that human activities can be kept within such bounds. It offers a "managerialist" approach to environment and development. Some theorists question whether we possess or will ever possess the wisdom and the will to "manage the planet" in such a fashion (Worster, 1995), yet the same could be asked of the other paradigms.

Security. We contend that sustaincentrism is more likely to keep ecosystems resilient to change than technocentrism; it is also more likely to keep socioeconomic systems resilient to change than ecocentrism, given current historical realities (e.g., poverty, population growth, unemployment). Sachs worried that sustainable development "locks the perception of the ecological predicament into the very worldview which stimulates the pernicious dynamics, and hands the action over to those social forces—governments, agencies and corporations—which have largely been responsible for the present state of affairs. This may turn out to be self-defeating" (1995: 429). He additionally asked whether sustaincentrism would necessitate an "ecoracy," a global ecological police force acting in the name of "one earth," raising the specter of "threats to cultural rights, democracy, and self-determination" (Sachs, 1995: 435).

In summary, sustaincentrism is seen as too radical, too naive, and too utopian by conventional technocentrists. It is not radical enough, not humble enough, and not transformative enough to deal with our global

ecological crisis in the eyes of ecocentrists. We would reject charges, however, that it merely travels the easy road of political compromise or sells out, in the end, to pragmatism. We believe it transcends or supersedes, at once both negating what is dysfunctional and preserving what is beneficial in the alienated poles of technocentrism and ecocentrism. This conclusion is based upon the assumption that sustainable human development, in the way we have formulated it, is desirable.

IMPLICATIONS FOR MANAGEMENT THEORY AND RESEARCH

Life has no meaning except in terms of responsibility.
Reinhold Niebuhr, 1892–1971.

Since the Enlightenment, thinkers have progressively differentiated humanity from the rest of nature and have separated objective truth from subjective morality. The greatest challenge of postmodern society may reside in their reintegration (Habermas, 1990; Taylor, 1989). A similar challenge may exist for management theorists.

Organizational science has evolved within a constricted or fractured epistemology, such that it embraces only a portion of reality. The organic, biotic, and intersubjective moral bases of organizational existence, we submit, have been neglected or repressed in the greater portion of modern management theory. This exclusion has resulted in theory which is at best limited and at worst pathological. By disassociating human organization from the biosphere and the full human community, it is possible that our theories have tacitly encouraged organizations to behave in ways that ultimately destroy their natural and social life-support systems.

The task ahead for management theorists is one of reintegration. Will management scholars reconceive their domain as one of organization-in-full community, both social and ecological? This integration may be the primary transformational challenge for management theorists as they strive for relevance in the new millenium. The transcendence of technocentrism and ecocentrism into sustaincentrism represents a tentative step in a journey toward management theory as if sustainability matters. It opens, rather than closes, the debate on the role of human organizations in our whole earth.

The conception of sustainable development as inclusive, connected, equitable, prudent, and secure human development suggests implications that are applicable to a broad range of management theory. Sustainability shifts boundary constraints from plenitude to limitation and from efficiency to equity. It suggests that management theories must be framed as if the world is relatively full, rather than empty. Organizations collectively confront limits, both social and biophysical. Both regenerative (source) services and absorptive (sink) services of natural systems are limited (Goodland, 1992). Organizations confront social and physical carrying capacities in any region of operation; scale is bounded by finitude (Ehrlich, 1994).

Because the world is no longer empty, strategies for reducing economic inequality cannot depend on expanding the scale of human activity. Sustainable development imposes a constraint of distributive justice (i.e., fair distribution of benefits and burdens) upon the efficient allocation of resources as determined by the market. Theories of management, which, when implemented, serve to redistribute wealth from the poor to the rich, or from the future to the present, would thus be inconsistent with sustainable development. Sustainability may represent an emergent "hypernorm," under which a range of ethical belief systems will converge to limit the moral "free space" of organizations (Donaldson & Dunfee, 1994; Taylor, 1989).

As constraints of optimal ecological scale are approached and rules of fair distribution are enforced, societal goals are likely to shift from *growth* to *development*. Societies that shift from growth to development must find ways (now only dimly perceived) to have organizations operating within them to do the same. Thus it can be expected that organizational incentive systems will shift in emphasis from *quantity* to *quality*. Organizations in harmony with sustainability will increase the quality of life in equitable ways that maintain or reduce energy/matter throughput. Such organizations cannot grow indefinitely, but they can develop indefinitely. This idea implies removing assumptions of infinite growth from theories of strategy and organization. It is based on theorizing about qualitative improvement in the absence of quantitative expansion.

Sustainable development suggests shifts in how management scholars conceptualize organizations. It includes translating the *organismic metaphor*, which is so prevalent in organizational theory, into actual *reality*. Restricting the metaphor to only human elements of the environment and to only human-related exchanges across organization-environment boundaries has unduly restricted the conceptualization of organizations. Advocates of the sustainability paradigm demand a complete notion of the external environment, an acknowledgement of the full range of material exchanges with the physiosphere, ecological exchanges with the biosphere, and nonmarket exchanges with the broader sociosphere.

Sustainability also demands fuller acceptance of *systemic interconnection*. Such a view would see organizations both partially causing and being affected by biodiversity loss, climate change, freshwater scarcity, food insecurity, population growth, persistent poverty, gender bias, and explosion of megacities. Its believers would suggest ways in which organizations could thrive by helping to resolve these global problems. New insights about system dynamics and predictability emerging from the study of complex systems may become critical in making these connections (Costanza et al., 1993).

The idea of sustainable development pushes management research toward interdisciplinary and *transdisciplinary* modes of inquiry. Although management theorists have established strong links with many

social sciences, there is little evidence of cross-fertilization with natural and physical science. Indeed, transdisciplinary approaches will be difficult to achieve, given the social organization and incentive systems of academia. Significant contributions toward understanding ecologically and socially sustainable economies, societies, and organizations, however, will arise only from new fundamentals, new languages, and new lenses. Ultimately, the study of sustainability may draw researchers beyond the puzzle-solving exercises of normal science (Kuhn, 1970) toward the realm of postnormal science (Funtowicz & Ravetz, 1993).

Along with these general shifts of emphasis, we see a need for three central transformations if management theory and research, in which sustainability matters, are to develop.

Agency to communion. Futurist Willis Harman argued that "business has become, in the last century, the most powerful institution on the planet. The dominant institution in any society needs to take responsibility for the whole" (Harman, cited in Hawken, 1992: 100). However, we sense that large corporations are increasingly becoming merely transient members of communities, embracing only parts of the world that happen to be useful to them, and cocooning themselves in contented pockets of the planet, while the larger biosphere and full human community atrophy (Gladwin, 1993b). Has the body of management theory inadvertently encouraged this diminishment of communion and enlargement of hyperagency (i.e., excessive concern with autonomy and self-preservation)? Do theories emphasize organizational freedom over union, rights over responsibilities, independence over interdependence, and what works (efficiency) over what is worth pursuing? Have management theories, when implemented, pushed organizations into a pathological agency, where severance from communities (both human and ecological) sets forces in motion that eventually destroy the conditions upon which organizations ultimately depend?

Admittedly, the suggested research agenda is extensive and radical. Does sustainability require organizations to develop a sense of place, to become rooted in communities? Do forces of globalization and the mobility of financial capital systematically work against the idea of organization-in-community? Does free trade work to the benefit of all or only serve a narrow range of established interests (Bhagwati, 1993; Daly, 1993; Lang & Hines, 1993)? Does sustainable development require a new protectionism or a renationalization of capital?

Indeed, what are an organization's social contract with society and natural contract with the biosphere? Do charters of incorporation imply duties of sustainable corporate citizenship and accountability (Grossman & Adams, 1993)? Can stakeholder models be extended to be more spatially and temporally inclusive (Chappell, 1993; Donaldson & Dunfee, 1994; Roddick, 1991; Starik, 1995)? Are positive contributions to sustainability more likely to arise from organizations that are more female versus male in their values spheres (Merchant, 1990; Shiva, 1989; Warren, 1994)?

Behind all of these questions is the larger question: What is the purpose of organizations (Handy, 1993)?

Exterior to interior. Future researchers may need to focus on whether sustainability requires shifts in human thinking (from linear to cyclical, analytic to synthetic, reductive to integrative) and whether it is possible to increase the rate of people's evolutionary consciousness toward a "new mind" appropriate for a sustainable world (Ornstein & Ehrlich, 1991). Researchers will need to confront, in this regard, the possibility that humans and their organizations have been programmed by evolutionary forces to instinctively discount over both time and space, such that the extended mental and moral embrace required in sustaincentrism may be difficult to obtain.

Along with cognitive transformation, sustaincentrism also requires profound value change toward stewardship, equity, humility, permanence, precaution, and sufficiency. Are members of the organizational science community willing to seriously entertain ethical and value-laden questions? Sustainability, like human medicine, mixes both descriptive and normative or action-guiding content. Has our domain become devoid of ideas dangerous to greed, shortsightedness, indulgence, exploitation, apathy, narrowness, and other values inconsistent with sustainability (Orr, 1994)? In short, the study of sustainability must shift from objective to subjective, from exterior nuts and bolts to interior hearts and minds.

Concept to implementation. Although a broad, overlapping consensus is forming around the goal of sustainable development, progress depends on greater attention to issues of transformational change and operationalization. Some theorists argue that business is the only institution in the modern world powerful enough to foster the changes necessary for ecological and social sustainability (Hawken, 1993). However, in order to harness this power, sustainable behavior must become a source of competitive advantage (Collins & Porras, 1994; Makower, 1994; Scott & Rothman, 1994; Shrivastava, In press). There will also need to be major shifts in public policies to provide appropriate signals for pushing and pulling organizations toward sustainability (Schmidheiny, 1992). Creative institutional or cultural reforms may be needed to overcome the problems of collective action, limits of altruism, prisoners' dilemmas and social traps that so pervasively affect human and organizational behavior (Cross & Guyer, 1980; Fox, 1985; Hardin, 1982).

Operationalization and measurement of sustainability along the lines of the principles offered in Table 3 remain in their infancy, and many difficult technical and conceptual questions have not yet been addressed (Cernea, 1993; Serageldin, 1994). Practical decision-support tools are needed to systematically include sustainability criteria in evaluating the design and selection of products, processes, and projects. Further development of tools such as design for environment, life-cycle analysis, full-cost pricing, and industrial ecology models may be useful in this quest (Allenby & Richards, 1994). These tools of "greening," however, which

focus on instrumental or process objectives such as pollution reduction or continuous improvement, must be transformed into tools of "sustaining" that focus on ultimate or outcome objectives such as assuring ecosystem and sociosystem health and integrity. Tools of greening, in other words, move organizations in the right direction, but fail to inform them about the distance from or variance with the ultimate destination of sustainability. Management must shift from the prevailing metaphor of greening (Walley & Whitehead, 1994), which merely "reduces the bads" to that of sustaining or "realizing the goods."

CONCLUSION

According to The World Bank, "the achievement of sustained and equitable development remains the greatest challenge facing the human race" (1992: 1). Transforming management theory and practice so that they positively contribute to sustainable development is, in our view, the greatest challenge facing the Academy of Management. In his 1993 Presidential Address to the Academy, Donald C. Hambrick urged us to break out of our insularity, to take responsibility for improving the management of institutions all around the world, and to strive for influence and impact in the world of practical affairs (1994). If the Academy is to "matter," according to Hambrick, it must "make significant contributions to the solution of major problems facing our society" (1994: 15). Imagine the impact the Academy could have if members genuinely accepted and oriented their work in accordance with "The Earth Pledge" of the June 1992 United Nations Conference on Environment and Development:

> Recognizing that people's actions toward nature and each other are the source of growing damage to the environment and resources needed to meet human needs and ensure survival and development, I PLEDGE to act to the best of my ability to help make the Earth a secure and hospitable home for present and future generations.

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Thomas N. Gladwin received his Ph.D. in international business and natural resource policy from the University of Michigan. He is currently Director of the Global Environment Program at the Leonard N. Stern School of Business, New York University. His research focuses on environmental management, global sustainability, and corporate social responsibility.

James J. Kennelly is a doctoral candidate in management and international business at the Leonard N. Stern School of Business, New York University. His current research interests include the relationship between multinational corporations and sustainable development and the application of stakeholder theory to international dimensions of business and society issues.

Tara-Shelomith Krause received her B.S. in Engineering from the United States Military Academy and M.B.A. from New York University. She is currently Associate Director of the Global Environment Program at the Leonard N. Stern School of Business, New York University. Her research focuses on sustainable human development, philanthropy, community development, and human rights in relation to global business.