SUSTAINABLE DEVELOPMENT AND PHILOSOPHIES OF TECHNOLOGY

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Although development is a complex, sometimes contradictory, and always multifaceted phenomenon, it has been studied primarily in the guise of economic growth, without qualification. The notion of *sustainable* development has been introduced, in recent years, to help restore both complexity and balance to discussions of development. That more complex concept is our focus here. But sustainable development, in its turn, is subject to different, and often conflicting, interpretations. Our first purpose here is to review some of the most common of these interpretations. We then go on to probe beneath the surface of these interpretations to discover the implicit or explicit philosophies they presuppose. Then, finally, we relate these philosophies to work specifically in the field of philosophy of technology.

INTERPRETATIONS OF SUSTAINABLE DEVELOPMENT[1]

Five interpretations are discussed here. The first is that provided in the so-called Brundtland Report, which has had a great deal to do with the subsequent popularity of the term. We then take up, in order, attempts to quantify, or operationalize, the concept of sustainability; a neo-Marxist critique; the reaction of so-called deep ecologists; and the views of anti-development theorists, who see sustainable development as simply an ideological mask for old-fashioned development.

Sustainable Development in the Brundtland Report: In one sense, sustainable development may be viewed as no more than an updated version of the older appropriate (or alternative) technology movement. Although the newer slogan seems to have appeared first in the early 1970s, it was a report of the U.N. World Commission on Environment and Development, *Our Common Future*,[2] that did more than anything else to make the phrase "sustainable development" popular. The report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to

meet their own needs." The intention was to produce a practical definition, one that would lead to "changes in access to resources and in the distribution of costs and benefits."[3]

An important aspect of the perspective of the Brundtland Report was to tie sustainable development to the inclusion of future generations in present-day calculations of the costs of economic development. This may seem to bring in philosophical—even transcendental—considera-tions. Consider, for instance, this sweeping claim: "Living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability. Yet many of us live beyond the world's ecological means, for instance in our patterns of energy use."[4]

But the report did focus on practical strategies for reviving growth (while at the same time changing its terms); for meeting essential needs (food, water, energy, work, sanitation); for controlling population growth; for sustaining, and if possible enhancing, basic resources; for reorienting technologies and managing the risks associated with them; and for including concerns for the environment within economic calculations. And it was recognized that these changes would require further changes in economic, social, and political structures within individual states and at the international level.

Because of criticisms to be addressed later, it should be noted here that the Brundtland Report is explicit on one point: overriding importance, in considerations of essential needs, should be given specifically to the needs of the world's poor.[5]

It might be thought without further reflection that there are vaguenesses and conflicting tendencies built right into the Brundtland Report's definition(s), but a series of critics have stepped forward to point them out for us.

Attempts to Quantify the Concept of Sustainable Development: To obviate the charge of vagueness in the definition of sustainability, some authors have attempted to provide an operational definition—or at least a set of measurable indicators.

According to Jan Bojo, Karl-Goran Maler, and Lena Unemo, it is

possible to interpret the Brundtland definition as demanding that "all options [be] preserved, which would imply the preservation of all kinds of resources."[6] This might, they say, even lead to the ridiculous conclusion that no oil—or iron or any other exhaustible resource—should be used; that all resources ought to be left for future generations. To avoid any extreme implication of this sort, Bojo, Maler, and Unemo propose an operational definition of sustainability that allows for substitutions:

> Economic development in a specified area (region, nation, the globe) is sustainable if the total stock of resources—human capital, physical reproducible capital, environmental resources, exhaustible resources—does not decrease over time.[7]

Or again:

> If physical or human capital can be sustained for an environmental resource, then the environmental resource can be exploited in such a way that it is severely reduced if, and only if, the investments in the stock of human and physical capital are such that the total resource base is not reduced.[8]

Bojo, Maler, and Unemo go so far as to say: "The cutting down of forests in order to increase export earnings is consistent with sustainable development." But they add immediately: "Only if the whole or parts of the proceeds are invested in other export earning or import reducing activities in order to maintain the welfare of future generations."[9] Bojo, Maler, and Unemo reduce all of this to one claim: "The basic idea behind this [operational] definition is substitutability."

These economists are not unaware of difficulties—for example, how to evaluate resources in a precise way, or how to provide economic incentives for poor countries to invest in sustainability. But they do try to deal with the difficulties, and a good part of their book is devoted to devising measures of value preferences, to working out the appropriate cost-benefit analyses, and to providing concrete examples of economic analyses of issues such as soil erosion and deforestation.

Even granting the care with which Bojo, Maler, and Unemo deal with the

problems associated with an operationalization of sustainability in terms of substitutability, further problems still dog the approach. To meet these further problems, another group of economists—in a volume edited by Onno Kuik and Harmen Verbruggen[10]—asks whether completely objective measures of sustainability can be devised. In the end, one of their contributors, ten Brink, suggests this: "[Sustainability] requires a political choice, which must be continuously adjusted as a result of new knowledge, changing social requirements, or unforeseen developments in the economic and ecological system."[11] Even so, the contributors to the Kuik and Verbruggen volume are convinced that factual *indicators* of the state of the relevant economies and ecologies can be made available to those who must make the political decisions needed to assure sustainability.[12] In particular, some of these authors say that environmental indicators "can be defined as quantitative descriptors of changes in either anthropogenic environmental pressure or in the state of the environment."[13]

The first type, *pressure* indicators, include measurements of pollution, overexploitation, and human-induced changes in ecosystems—especially specific changes in specific locales.

The second type are *effect* indicators, i.e., quantifications of the effects of changes in environmental quality that have negative impacts over time either on humans (e.g., in terms of health or welfare) or on the biosphere. For the latter, they say, "One could monitor environmental effects by looking at qualities and sizes of populations, niche size, or biotypes."[14]

Finally under this heading, one of the authors makes another distinction, between retrospective indicators (e.g., traditional trend projections) and *predictive* indicators.[15] The latter are said to be especially important for management and planning.

In general, this second economic approach to defining sustainability is less sanguine than the first when it comes to providing quantitative data for development planning, but these authors—like the first set—are convinced that those who want to establish policies for sustainable development *must* have adequate ecological as well as economic data (whether operational in the strict sense or not).

What is common to both groups of authors is that they do not seem to give the highest priority, in their operational definitions or social indicators, to *human needs***.**

A Neo-Marxist Perspective on Sustainable Development: Third-World spokespersons (or those claiming to present their point of view)—especially if, on other grounds, they are already suspicious of the capitalist underpinnings of traditional development theory—are quick to point out that the operationalizers have not accorded the same high priority to the needs of the poor, and poor countries, as had the Brundtland Report itself. As W. R. Redclift puts it, "Unless poor people are involved in meeting their aspirations," development can never be appropriately sustainable.[16] This recalls a theme of the Brundtland Report; in assessing needs, the report says, "Overriding priority should be given…[to] the concept of `need,' in particular the essential needs of the world's poor."[17]

Redclift takes this emphasis for granted in his attacks on both traditional development theory and orthodox Marxism. Redclift even attacks sustainability if the concept is misused: "The constant reference to 'sustainability' as a desirable objective has [sometimes] served to obscure the contradictions that 'development' implies for the environment."[18] What Redclift objects to in his opponents is a lack of rigor and objectivity; but the particular sort of scientific approach he calls for requires some explanation.

According to Redclift, what is called for is a *historical* analysis of the relationship between development and the environment. And such an analysis, he says, will reveal the limitations of those approaches that view development exclusively in terms of economic growth. Cultures not burdened with this conception—the example he gives is pre-Columbian America—understood sustainable development very differently. Historical analysis shows that international contacts have almost always meant exports of capital and natural resources—often at the expense of local labor. According to Redclift, there is a consistent "historical process which links the exploitation of resources [by] the more industrialized nations with those of the South." Furthermore, a *political economy* approach is required according to which "the outcome of economic forces is clearly related to the behavior of social classes and the role of the state" in aiding exploitation.[19]

Redclift's point, relative to sustainable development, is that current development trends cannot continue without unacceptable levels of environmental damage. In the case of so-called developing countries, according to Redclift, development always takes place in the context of the international economy. Yet a globalized economy ignores the very real differences in the environmental objectives of developed and developing countries. In developing countries, truly sustainable development presupposes that economic productivity can be maintained in the face of systemic disturbances, and the impact of population growth—especially the basic needs of a growing population—must be taken into consideration. All of which makes sustainability a matter of p*olitic*al *power*. "Sustainable development options . . . can only be achieved through political changes at the local, national, and international level."[20]

This is the link, for Redclift, between the needs of the poor and sustainability—which cannot be maintained "unless poor people are involved in meeting their aspirations."[21]

> Industrial growth needs to be redirected towards meeting the needs of the world's majority; renewable energy resources need to receive a greater share of attention; natural resources and policies need to be shifted from the arms race to the protection of agronomic and biological resource systems.[22]

And, in a final swipe at the alleged scientific character of standard economic analyses, Redclift concludes:

> Sustainable development, if it is not to be devoid of analytical content, means more than seeking a compromise between the natural environment and the pursuit of economic growth. It means a definition of development which recognizes that the limits of sustainability have structural as well as natural origins.[23]

In Redclift's view, clearly, the environment alone is not the key factor in making development sustainable; it is political power, and in particular giving power to the workers in developing countries to set their own goals—presumably ones that will not damage their environments as development has heretofore.

Environmental Ethics and Sustainable Development: In this section, we look at two authors who make protection of the environment the most important aspect of sustainability. The first author to be considered is Stanley Carpenter; according to him, the Brundtland Report tries to reconcile two irreconcilable goals. One goal is to revive growth (at least partly to meet the needs of the world's poor); the other is to avoid environmental degradation. What is wrong with this, for Carpenter, is that the "predominant" theory relied on in the Brundtland Report to assure the achievement of these goals is *indefinite growth*. This is incompatible with a goal of living within natural limits, yet it is never categorically repudiated by the World Commission.[24]

Carpenter quotes William Ruckelshaus (sounding like Redclift, above):

> On the one side, the industrialized world engages in technological practices that produce wealth and comfort for 20 percent of the world population while drawing down the productive capital of the globe. At the same time, the remaining 80 percent of the world's inhabitants are coerced into replacement of marginally sustainable agriculture with cash cropping and attendant destruction of fragile ecosystems. . . . A colonialism of primary resource exploitation, imposed on [less developed countries] by the industrialized countries, thus radiates unsustainable patterns around the globe.[25]

This, Carpenter thinks, reflects the problem a decade or so ago. But, he argues,

> There is now an awareness of a new scale of impact upon the geological and biological systems of the planet resulting from human action. . . . Because human impacts are now planetary in scale, the scope of the sustainability discussion is broadened. At this time, therefore, there are prudential reasons for the race as a whole to acquire a sustainability consciousness.[26]

Much of Carpenter's paper is devoted to criticizing the Brundtland Report for not adequately distancing itself from neoclassical economic theory: "The linking of economics and ecology," he says, "perpetuates unsustainable systems." And he is particularly caustic about the substitutability assumption of those who have attempted to quantify or operationalize the Brundtland Report definition of

sustainability (see above). According to Carpenter, the "technologies that are licensed by existing economic models [including allegedly sustainable models] are not only incompatible with ecological concerns, they are inimical to them."[27]

Carpenter does not refer to neo-Marxist alternatives to the standard model (see the discussion of Redclift, above), but he ends his paper with a reference to Mark Sagoff's new "virtue" economic model. According to Sagoff, previous economic models have used as their standard the ideal society—which he sees as the enemy of the good society. In Sagoff's view, economics is a matter of cooperative human behavior—including cooperation to preserve and conserve natural resources, to preserve nature itself not as a resource but as the common matrix within which humans live as part of nature.[28]

Carpenter also refers at the end of his paper to the other cornerstone of his view, the notion of *autopoiesis*. He quotes ecologists (such as W. Rees[29]) on this notion, defining autopoiesis as "the process whereby living organisms draw from a constantly regenerated environment and reorganize themselves." And it is this process, Carpenter says, that necessarily comes into conflict with the demand for infinite growth postulated by almost all current economic models.

Though his tone is alarmist, Carpenter's paper is primarily analytical. The other author considered under this heading, Vandana Shiva, is much more prescriptive. She is the author of *Staying Alive: Women, Ecology, and Development*,[30] a cry of outrage over the devastation of ecologically sound agriculture in rural India.

Like Sagoff, Shiva espouses a biocentric view, in which human life is only a part of the whole system of life. She calls up the "ancient idea about the relationship between humans and nature—that the earth bestows gifts on humans who, in turn, are well advised to show diligence in order not to suffocate her generosity."[31]

Shiva is also caustic about current economic models, including ones that maintain that sustainability can be maintained by substitution of resources. She quotes Robert Solow: "If it is very easy to substitute other factors for natural resources, then there is, in principle, no problem. The world can, in effect, get along without natural resources, so exhaustion is just an event, not a catastrophe."[32]

To which Shiva replies: "This . . . refers to sustaining not nature, but development itself. Sustainability in this context does not involve recognition of the limits of nature and the necessity of adhering to them."[33]

In the end, what Shiva says is this: "Sustainability in nature implies maintaining the integrity of nature's processes, cycles, and rhythms."[34]

Neither Carpenter nor Shiva would admit to being anti-development if that meant turning our backs on the world's poor; it is just that they insist that development as normally thought of—even by those espousing sustainability—will end in catastrophe for rich and poor alike, for rich countries and poor countries, if we do not learn to live within the limits set by Shiva's "nature" and Carpenter's "autopoiesis."

Others are convinced that we must give up notions of development—including allegedly sustainable development—entirely.

A Radical Philosophical Critique of Sustainable Development: We focus here on the negative comments on sustainability of Wolfgang Sachs—though several other authors could be listed under this heading.[35] Sachs refers to development in any guise, sustainable or not, as an "outdated monument to an immodest era."[36]

According to Sachs, the biological metaphor of the evolution of nature has been turned into an economic metaphor—development—and then into an imperative for all of humankind. The result is to treat people, whole societies, and nature itself as resources for economic development. But, Sachs says, "Labeling things as 'resources' takes off whatever protective identity they may have and opens them for intervention from the outside. Looking at water, soils, animals, people in terms of resources reconstitutes them as objects for management by planners and for pricing by economists."[37]

Sachs considers the notion of sustainability to be utopian. The term only serves to revitalize development, to give it another lease on life, by tying it to concerns for the environment. He admits that what he calls "eco-developers" are in some sense distinguishable from traditional advocates of development—most obviously in their admission that there are environmental limits on production.

However, "What ties them nevertheless to the economic worldview is the failure to appreciate cultural limits to the predominance of production, cultural limits that render production less important and consequently relieve also environmental pressure."[38]

Even the best of the sustainability advocates, Sachs maintains—listing Amory Lovins and those associated with the Worldwatch Institute[39]—are utopian. For them as for other development advocates, "Efficient behaviour spreads at the expense of culture-guided behaviour; it undermines non-economic notions of the good and proper life."[40] The sustainability advocates also fall afoul of the either-or fallacy; they assume that the opposite of development is stagnation. However, according to Sachs, "Distinctions such as backwards/advanced or traditional/modern have . . . become ridiculous given the dead end of progress in the North, from poisonous soils to the greenhouse effect."[41]

The crucial point, for Sachs, is the notion of culture; and, according to him, "Development always suggests looking at other worlds in terms of what they lack, and obstructs the wealth of indigenous alternatives which they could inspire."[42] One of Sachs's collaborators, Gustavo Esteva, puts the matter bluntly:

> In exchange for culturally established images, built by concrete men and women in their local spaces, in exchange for concrete myths, truly real, modern man was offered an illusory expectation, implicit in the connotation of development and its semantic network: growth, evolution, maturation, modernization. He was also offered an image of the future that is a mere continuation of the past.[43]

For Esteva as for Sachs, opposing development is not reactionary; rather, to advocate development—even sustainable development—is to fall victim to a reactionary myth. It is the multiple and diverse cultures of the world, and in particular the so-called undeveloped world, that can offer us hope. What we need, Sachs says, is "efforts to elucidate the much broader range of futures open to societies which limit their levels of material output in order to cherish whatever ideals emerge from their cultural heritages."[44] This is sustainability of a sort the economists have never dreamed of.

PHILOSOPHICAL PRESUPPOSITIONS OF THESE INTERPRETATIONS[45]

All five of the interpretations of sustainability discussed here have philosophical presuppositions. Some are more obvious than others—and perhaps least obvious are the suppositions of the Brundtland Report. That will be saved for last, while we begin with the most obvious case.

The Quantifiers: It would be simplest to say simply that the two sets of economists discussed earlier—Bojo, Maler, and Unemo, and Kuik and Verbruggen (and their contributors)—are positivists. They want to reduce the complexity of the sustainable development process to mathematical simplicity. And Bojo, Maler, and Unemo explicitly demand operational definitions—one touchstone of the early days of Logical Positivism.[46] But that would be too hasty; all sorts of philosophers and scientists, and practically all economists (of whatever school), insist on operational definitions for some purposes.

The clearest indication of the philosophical presuppositions of the economists' definition of sustainability in terms of substitutability is to be found in the Kuik and Verbruggen volume. Granting that defining sustainability may be a political matter, these economists nonetheless insist on (and claim they can provide) *verifiable ecological data*. In the words of one of these authors (Brink): "If policymakers want to make rational choices concerning sustainable development, they have to define this concept and formulate verifiable ecological objectives, and . . . possess adequate economic and ecological information."[47] Actually, what Brink means is that the policymakers must be clear about their objectives, and the economists can then (perhaps) operationalize them and provide the relevant objective information (whatever their sources—statistical, sociological, etc.). This is very similar, as a methodology, to that of the early advocates of technology assessment.[48] It is also a common assumption of risk/cost/benefit practitioners who claim only to provide advice for managers in government or in the private sector. In all these cases, there is a clear assumption that facts are separable from values (policy decisions, etc.), and that basing decisions on objective facts—as free from biases as possible—is what makes those decisions rational (at least in ideal cases).

In short, the economists presuppose scientific objectivity and a concept of rationality based on a clear fact-value distinction—with the facts the more

important part of the dichotomy.

The Neo-Marxists: M. R. Redclift is perhaps clearer about the "traditional" Marxism he opposes than about the brand of transformed Marxism that he espouses—in the name of the poor and exploited workers of the Third World. But it is clear that he retains aspects of traditional Marxism: notions of class struggle, exploitation of workers, economic imperialism, and so on. He also labels his a structural and a historical approach. What Redclift would perhaps say is that there is a central core of explanatory concepts that cannot be ignored if one chooses to use a Marxist framework of any sort. (Many so-called Christian Marxists, particularly in Latin America, have made similar free use of Marxist concepts for similar purposes of helping the poor of the Third World.)[49]

Redclift probably falls most clearly within the camp of those who have recently referred to themselves as Marxist environmentalists.[50] However, in his case, an adequate global environmentalism must deal with the problems that are related—Redclift says "structurally"—to population expansion in the Third World and to the legitimate claims that poor countries have against exploiters using the rhetoric of a "global economy."

Redclift's approach, then, may be (almost) uniquely his own, yet he makes enough references to core Marxist ideas, to Marxist environmentalism, and to spokespersons for the Third World for us to identify his basic presuppositions. Like Marx in his attacks on the evils of the early Industrial Revolution, Redclift is (at least in part) a moralist deeply troubled by injustices to the poor in less developed parts of the world. Furthermore, he assumes that orthodox economic development theory is ideological rather than objective (or scientific); that workers in the Third World have been, demonstrably, exploited in the name of development; that Third World politicians have colluded with their people's exploiters; and—most relevant to the sustainability issue—that devastation of the environment in Third World countries is a result of pressures from the global economy rather than a result of legitimate demands of the poor.

Anti-Development Culture Critics: There is a kind of perfectionism at least latent, sometimes explicit, in culture critics of technological development. This is clearest, perhaps, in someone like Jacques Ellul;[51] who takes pride in being absolutely rigorous about what he views as the sociology of technological

societies. Ellul claims to be just telling us "what is factually true" about such societies, though he clearly does not mean this in some narrow, fact-gathering academic sociology sense. Indeed, Ellul seems clearly to be invoking some sense of Absolute Truth[52]—even when he talks about practical, concrete issues such as the transfer of particular technologies to the Third World.[53]

Wolfgang Sachs may not be quite as belligerently intransigent as Ellul, but he is rigidly insistent that we should never forget that the history of development in Third World countries has involved tragic choices. And the tragedy has been visited primarily on the cultural values of people forced by economic imperialists to accept the development model whether they wished to—indeed, whether they understood the terms of the bargain—or not. Indigenous peoples everywhere have been coerced into forced labor—and have often died as a result. The fruits of their labors have not accrued to them but have been sent to capitalists far away. On all these points, the culture critics agree with the Marxists and other radicals. But, according to the culture critics, material, physical, economic deprivations and exploitations pale by contrast with the loss of the spiritual values indigenous peoples have been forced to give up.

What native peoples (the culture critics continue) have to contribute to our intellectual understanding—especially to those who have been hoodwinked by the development myth—is spiritual diversity. These peoples have embraced ideals and ways of seeing and thinking and feeling—especially in terms of ways of experiencing nature—that the modern Western world, addicted to a narrow scientific rationalism, is starving for.

The culture critics assume a stark contrast—between modern and pre-modern value systems—and think the pre-modern, mysterious, mystical, metaphysical systems are the more valuable, especially in terms of true, long-term sustainability of the natural world, including humankind's place in it.

Deep Environmentalists: Some of the authors under this heading share many assumptions with the culture critics—especially a biocentric assumption that links the human race's survival to the survival of life on earth. Where they part company with the culture critics is in being less sweeping in their indictment of all of Western values. Both agree that a consumption orientation is bad, and that the developed-nation-led global economy generates the pressures that lead to

deforestation and desertification and similar problems in Third World regions. Many of the more strident environmentalists also call for a wholesale change in values, a relinquishing of the consumption orientation. And some of the so-called deep ecology advocates share a quasi-religious zeal and even a special respect for native, especially Native American, values.

But the tone of environmentalist contributors to the sustainability debate—even of the deep ecologists—is different. They focus primarily on nature, not culture. Stanley Carpenter, as just one example, believes we need to appeal to scientific evidence, in particular the growing ecological evidence that autopoiesis—the ability of life on earth to regenerate itself after injury—is seriously threatened by mindless and heedless human development. Perhaps Native American habits were more mindful of nature, but the point is to change the thinking, *now*, of consumption-oriented people in the United States, North America, Europe, and the Pacific Rim, and of the corporate managers who feed and foment consumption. The aim is practical, to influence public and corporate policy.

What environmentalists are passionately committed to is saving Planet Earth; they want to avoid a catastrophe that will seriously damage the earth's ability to regenerate itself. In the end, it is environmental values rather than cultural values that they are most committed to—though many environmentalists are clearly aware that changes in cultural values may be needed to protect environmental values.

The Brundtland Report: Here, lower-level assumptions are operative, though saying so is not meant to denigrate the idealism of the authors of the report, and especially of the commission's chairperson, Gro Harlem Brundtland. But the report was intended to be a practical document, a plan for real work of real-world agencies and governments. Though the document is filled with compromises, they are not compromises between, say, academic economists and neo-Marxist critics. They are compromises of government and private-institution leaders from developed countries with leaders of Third World countries.

The two most prominent perspectives represented in the document, of those mentioned here, are economists and environmentalists. (This is not to say that the voice of poor countries—here represented by a Marxist—were not heard;

they clearly were.) Furthermore, there is evidence of battles even among the economists, between those who really would use sustainability as a slogan to revive old-style development and those who genuinely sought to incorporate environmental aims into practical sustainable development policies. The compromises go on and on.

Nonetheless, the Brundtland Report does have more coherence than the critics suggest. In essence, it is a compromise between views favoring development in the name of a global economy and attempts to balance developmental and environmental policies. There also is more than token recognition that population pressures and the needs of the poor in the Third World have the potential to threaten any environmental balance that might be worked out.

CONCLUSION: THE SUSTAINABILITY DEBATE AND PHILOSOPHY OF TECHNOLOGY

A Note on Methodology: Making explicit the methodology used in discovering the underlying assumptions of parties to the sustainability debate can move us toward link-ups with the philosophy of technology. Knowing the risks, we have nonetheless utilized the somewhat odd scheme of Walter Watson in *The Architectonics of Meaning: Foundations of the New Pluralism*.[54] We certainly do not endorse the exaggerated claim (on the book's cover) that Watson has devised "the first truly useful taxonomy of all ideas," but, stripped of such overbloated claims, Watson's book offers an interesting *hermeneutic*.

In Watson's view, every author (including public speakers) betrays his or her philosophical assumptions by differentially utilizing the four necessary components of any piece of literature:

—author's *perspective* (which may be entirely personal or that of a tradition and may be hidden even from the author);

—*objects* discussed;

—the text itself, and especially the methods that link items to one another; and

—the goals or *principles* (ideals, values, etc.) that drive or motivate the text (and which almost always reflect sets of background assumptions, such as the cultural values influencing both individual authors and intellectual traditions).

According to Watson, authors or speakers who stress objectivity above the other three components employ a scientific writing style (though that is not Watson's term for it). They tend also to use logical methods, invoke reductionistic aims, and try to avoid values as much as possible. Authors who consciously stress values and see the objects of their discourse as this-worldly shadows of otherworldly realities—typically linking the two by a method explicitly referred to as "dialectical"—Watson links to Plato. They tend to emphasize comprehensiveness, and often disparage narrow technical scientific knowledge. Authors, third, who stress method and discipline (in the school subject matter or professional discipline sense), and who emphasize the pigeonholing of objects within large encyclopedic schemes, Watson links to Aristotle. (Some Aristotelians think this is a caricature which ignores the natural-biological, interdisciplinary, and practical aspects of Aristotle—especially in his opposition to Plato.) The fourth perspective requires a little more elaboration.

A significant feature of Watson's scheme—which represents a break with his mentors, especially Richard McKeon[55]—is his recognition of a fourth basic group. These authors emphasize their own subjective perspective, their own creativity, as an end in itself. In terms of method, they often tend to be anti-methodical, to utilize any means that will move the narrative (story, drama, etc.) along. Watson links this group to the Greek Sophist Protagoras (for whom humans are the measure of all things) and defends this as a philosophical perspective fully parallel with the other three.

Finally, Watson acknowledges that the four basic groups do not exhaust the stylistic field; many authors combine modalities. As Watson recognizes, almost all the great philosophers of the modern period, after Descartes, have tended to use hybrid styles. (Even so, a hybrid style is recognizable—Watson thinks—as a joint use of two or more of the four basic styles.)

This is a perhaps hasty—maybe even more idiosyncratic than Watson's own—account of an enormously complicated scheme. But it may be enough to suggest that a hermeneutic approach, roughly along Watsonian lines, can help

discover philosophical presuppositions—in this case, the philosophies of technology implicit (or sometimes explicit) in the sustainability debate. *However*, where Watson's aim seems to be Aristotelian, to pigeonhole authors, we would call our aim (in Watson's terms) *creative*. We want to *let the authors have their own say* about what it is they want to emphasize in the sustainability debate.

The Sustainability Debate and Philosophy of Technology: We can apply Watson's method, however briefly, to summarize and bring this paper to a conclusion.

It seems crystal clear, first, that the economists/operationalizers affect a scientific style. As the critics claim, they may also have limited aims—perhaps even an implicit reductionist stance that the critics would see as hostile to environmental values. In spite of this, it is also clear that these sustainability economists have the best of intentions. They believe, sincerely, that society has no chance of achieving a sustainable environment in the face of development if the most objective scientific evidence is not utilized. The critics may have noble goals—these economists would say—but they will never be achieved if there are no precisely calculated means for their accomplishment.

The best known philosopher of technology with an approach similar to these economists is Mario Bunge. His model of what he calls "sociotechnology" includes exactly the same policy/facts model as the economists mentioned here. And the few times he mentions the environment among the social problems to which he would apply sociotechnology are indirect—and always aimed at emphasizing the multidimensionality of social problems. For example: "The only effective social programs attack social problems from all sides, i.e., they have environmental, biological, political, and cultural components as well as an economic component."[56]

Though many environmentalists think economists have little that is constructive to contribute to sustainability, practitioners of a Bunge-type "exact philosophy" think their approach is not only valuable; it is the only one that is stated precisely enough, and is based on sufficient evidence, to get anything worthwhile done.

As for the culture critics, it seems equally clear that they tend to favor an

orientation toward something like a Platonic Good. This may not be explicit in Sachs (our example here), but Ellul is explicit in referring to his critique as dialectical.[57] Furthermore, Sachs's emphasis (like that of Esteva and the others mentioned in passing), on the spiritual values of indigenous cultures as the best hope for sustainability, also has a Platonic ring, at least in a broad sense.

A philosopher of technology who makes explicit reference to Plato (though he is clearly much less sweeping in his critique of technology than Ellul) is Frederick Ferré. He says philosophy of technology ought to be foundational. The explicit philosophy he espouses is organicist. And at least part of the reason he offers for this is the need to solve problems of the environment.[58]

"Deep" environmentalists are difficult to characterize in Watsonian terms. (For one thing, environmentalists tend to have many different sorts of philosophical backgrounds—or none at all.) But the ones referred to here tend to have a biocentric orientation that Aristotelians ought to endorse. Also, Mark Sagoff's environment philosophy, used by Carpenter, shows clear links to an Aristotelian virtue ethic. And at least some of the best advocates of sustainability on environmental grounds insist on a careful multidisciplinary approach with a solid grounding in the science of ecology. (On the other hand, some environmentalists follow Martin Heidegger in tracing the worst features of developmentalism to the Greeks, and to Aristotelian essentialism in particular.)

One of us has argued elsewhere for a Dewey-based social activism, including a progressive environmentalism, that has remote roots in Aristotle.[59] This seems to us to be relevant to the sustainability issue.

Redclift's Marxism is explicit even when he criticizes traditional Marxist developmentalism, so no Watsonian exegesis is required to infer which philosophy of technology he would appeal to. In any case, Marxist philosophers of technology—and in particular Marxist environmentalists[60]—seem clearly to have important things to say in the sustainability debate. And this despite the end of the Cold War and the revelations of environmental catastrophes in Communist East Europe.[61]

We can end by noting that other recent contributors to philosophy of technology—Albert Borgmann,[62] Larry Hickman,[63] and Don Ihde,[64] among

others—should have significant things to say about the sustainability issue. After all, sustainability is one of the most important issues in the history of humankind—indeed, in the history of life on Planet Earth—so as philosophy of technology comes into its own it clearly *must* address this issue.

NOTES

1. This paper falls into two parts, with this part written primarily by Cuello Nieto.
2. United Nations World Commission on Environment and Development, *Our Common Future* (New York: Oxford University Press, 1987). Most commonly referred to as the Brundtland Report.
3. *Ibid*., p. 43.
4. *Ibid*., p. 44.
5. *Ibid*., p. 43.
6. Jan Bolo, Karl-Goran Maler, and Lena Unemo, *Environment and Development: An Economic Approach* (Dordrecht: Kluwer, 1990), p. 13.
7. Ibid.
8. *Ibid*., p. 14.
9. *Ibid*.
10. Onno Kuik and Harmen Verbruggen, eds., *In Search of Indicators of Sustainable Development* (Dordrecht: Kluwer, 1991).
11. Ben ten Brink, "The AMOEBA Approach as a Useful Tool for Establishing Sustainable Development?," in ibid., p. 72.
12. Kuik and Verbruggen, *In Search of Indicators*, p. 1.
13. Hans Opshoor and Lucas Reijnders, "Towards Sustainable Development Indicators," in Kuik and Verbruggen, *In Search of Indicators*, p. 8.
14. *Ibid*.
15. Leon Braat, "The Predictive Meaning of Sustainability Indicators," in Kuik and Verbruggen, *In Search of Indicators*, p. 57.
16. M. R. Redclift, *Sustainable Development: Exploring the Contradictions* (London: Methuen, 1987), p. 35.
17. World Commission, *Our Common Future*, p. 43.
18. Redclift, *Sustainable*, p. 2.
19. *Ibid*., p. 3.

20. *Ibid*., p. 36.
21. *Ibid*., p. 35.
22. *Ibid*., p. 55.
23. *Ibid*., p. 199.
24. Stanley R. Carpenter, "Inventing Sustainable Technologies," in J. Pitt and E. Lugo, eds., *The Technology of Discovery and the Discovery of Technology: Proceedings of the Sixth International Conference of the Society for Philosophy and Technology* (Blacksburg, Va.: Society for Philosophy and Technology, 1991), pp. 481-492.
25. Quoted by Carpenter, in "Inventing Sustainable Technologies," p. 485.
26. *Ibid*., pp. 485-486.
27. *Ibid*., p. 487.
28. See Mark Sagoff, *The Economy of the Earth* (New York: Cambridge University Press, 1988).
29. W. Rees, "The Ecology of Sustainable Development," *The Ecologist* 20 (January-February 1990): 19.
30. Vandana Shiva, *Staying Alive: Women, Ecology, and Development* (London: Zed Books, 1989).
31. Vandana Shiva, "Resources," in W. Sachs, ed., *The Development Dictionary* (London: Zed Books, 1992), p. 206.
32. Quoted by Shiva, *ibid*.
33. *Ibid*., p. 217.
34. *Ibid*.
35. For example, Gustavo Esteva (to be cited briefly below), Ivan Illich, Carl Mitcham—and, in a very real sense, Shiva.
36. Wolfgang Sachs, "Bygone Splendour: On the Archeology of the Development Idea (I)," mimeo, presented to the Science, Technology, and Society Program, Pennsylvania State University, November 1989, p. 1.
37. Wolfgang Sachs, "The Gospel of Global Efficiency: On Worldwatch and Other Reports on the State of the World," *IFDA* [International Foundation for Development Alternatives] *Dossier* 68 (November-December, 1988):4.
38. *Ibid*., p. 6.
39. For Lovins, see Amory B. Lovins, L. Hunter Lovins, and Seth Zuckerman, *Energy Unbound: A Fable for America's Future* (San Francisco: Sierra Club Books, 1986). See also Worldwatch Institute, *State of the World 1992*

(New York: Norton, 1992).

40. Sachs, "Gospel," p. 7.

41. Sachs, "Bygone Splendour," pp. 7-8.

42. *Ibid*., p. 7.

43. Gustavo Esteva, "Development," in Wolfgang Sachs, ed., *Development Dictionary*, (London: Zed Books, 1992), p. 23.

44. Sachs, "Environment," in *Development Dictionary*, p. 36.

45. The remainder of the paper was written primarily by Durbin.

46. See, for example, Carl G. Hempel, "Operationism, Observation, and Scientific Terms," in A. Danto and S. Morgenbesser, eds., *Philosophy of Science* (Cleveland: World, 1960), pp. 101-120. Hempel cites P. W. Bridgman as the originator of operational analysis.

47. Brink in Kuik and Verbruggen, *In Search of Indicators*, p. 11.

48. See Alan L. Porter et al., *A Guidebook for Technology Assessment and Impact Analysis* (New York: Elsevier North Holland, 1980).

49. See, for example, Arthur F. McGovern, *Marxism: An American Christian Perspective* (Maryknoll, N.Y.: Orbis Books, 1980); also, Sergio Torres and John Eagleson, eds., *The Challenge of Basic Christian Communities* (Maryknoll, N.Y.: Orbis Books, 1981).

50. For some examples, see contributions to *Capitalism, Nature, Socialism: A Journal of Socialist Ecology* (begun 1988). See also William Leiss, *The Domination of Nature* (New York: Braziller, 1972), and several later works.

51. Jacques Ellul, *The Technological Society* (New York: Knopf, 1964; French original, 1954). The Ellul interpreter who lays heaviest stress on the "sociological" objectivity of Ellul's approach is Katherine Temple, "The Sociology of Jacques Ellul," in P. Durbin, ed., *Research in Philosophy and Technology*, vol. 3 (Greenwich, Conn.: JAI Press, 1980), pp. 223-261.

52. See John Boli-Bennett, "The Absolute Dialectics of Jacques Ellul," in *Research in Philosophy and Technology*, vol. 3, pp. 171-201. Also, Donald Phillip Verene, "Technological Desire," in *Research in Philosophy and Technology*, vol. 7 (1984), pp. 99-112.

53. See Joyce M. Hanks, "A Way Out in a No-Exit Situation?: Jacques Ellul on Technique and the Third World," in *Research in Philosophy and Technology*, vol. 7, pp. 271-286.

54. Walter Watson, *The Architectonics of Meaning: Foundations of the New Pluralism* (Albany: State University of New York Press, 1985).

55. Watson acknowledges McKeon, *ibid*., p. xii. McKeon's works on

the topic have been collected by Mark Backman, in Richard McKeon,*Rhetoric: Essays in Invention and Discovery* (Woodbridge, Conn.: Ox Bow, 1987). Another influence on Watson (perhaps only indirect—through McKeon—since Watson does not mention him) is Kenneth Burke, who emphasizes "stage" (or background of discourse) more than either McKeon or Watson. See Kenneth Burke, *On Symbols and Society*, ed. J. Gusfield (Chicago: University of Chicago Press, 1989).

56. Mario Bunge, *Treatise on Basic Philosophy*, vol. 7, part II: *Life Science, Social Science and Technology* (Dordrecht: Reidel, 1985), p. 290.

57. See note 52, above, for commentaries on the dialectics of Ellul.

58. Frederick Ferré, *Philosophy of Technology* (Englewood Cliffs, N.J.: Prentice Hall, 1988), esp. chapter 8.

59. Paul T. Durbin, *Social Responsibility in Science, Technology and Medicine* (Bethlehem, Pa.: Lehigh University Press, 1992), esp. chapter 10.

60. See note 49, above, on Marxism and development.

61. The most outspoken defender of the continued relevance of Socialism to philosophy of technology after the end of the Cold War is Andrew Feenberg, in *Critical Theory of Technology* (New York: Oxford University Press, 1991). Environmentalism is an important, though not the dominant, feature in Feenberg's new critical theory of technology.

62. Albert Borgmann, *Technology and the Character of Contemporary Life* (Chicago: University of Chicago Press, 1984), and*Crossing the Postmodern Divide* (Chicago: University of Chicago Press, 1992).

63. Larry A. Hickman, *John Dewey's Pragmatic Technology* (Bloomington: Indiana University Press, 1990).

64. Don Ihde, *Technology and the Lifeworld: From Garden to Earth* (Bloomington: Indiana University Press, 1990).