THE GREEN PARADIGM

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33

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THE GREEN PARADIGM

Abstract

Within the Western cosmology there are two distinct interpretations of how humans should relate to their environment, and for the purpose of this dissertation these interpretations have been characterized as cultural paradigms. The paradigms are not concrete entities, they are merely useful abstractions for grouping together mutually supporting assumptions. It is held that the socially dominant interpretation centres on an assumption that people are distinct from nature, while the alternative suggests they are a part of Nature. It is held that the expression of the axioms and assumptions which are collected within what is here called the Dominant Western Environmental Paradigm leads inevitably to a situation of stress and conflict between humans and their environment.

The existance of significant anthropogenic ecological stress in the planetary system is taken as given. It is argued that this stress is a symptom of an inappropriately conceptualized relationship between humans and nature. It is further held that the interface between human and nature is a traditional area of geographical concern, and that geography as a discipline should be taking active steps to research the problems and propose solutions. Reasons for the failure of geography as a discipline to address the issue adequately are explored.

It is argued that the process of working through the assumptions of the Dominant Western Environmental Paradigm leads to a situation where science, including geography, is subordinated socially to the dictates of economic rationality, and is thus unable to mount a significant challenge to the social and economic structures which are at the root of the ecolgical stress. It is concluded that only by the conscious process of stepping outside the dominant cultural paradigm will geographers be able to examine the full scope of the problems, and that by framing the disciplinary paradigm of geography so as to be in sympathy with the assumptions of the Green cultural paradigm geographers will discover new and appropriate tools of analysis as well as potential solutions to the ecological stress problem. A number of these are presented and explored. A failure to step outside the ruling framework will, however, constrain analysis. It is argued that no paradigm shift has occurred, on a disciplinary (geographical) or a cultural scale, but that alternative frameworks are sufficiently coherent to support the possibility of such a revolution.

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PREFACE

This dissertation examines the roots of what is commonly called the `environmental crisis'. In particular it examines the general failure of geographers to address this problem, and it does so against an examination the complex assumptions which it is held have led to the present situation. The study had its origins a number of years ago in piece of quantitative geographical research which was intended to find the `socio-economic factors leading to estuarine degradation'. The conclusion of that particular project was a great deal of raw data on lengths of tarred roads, periods of residence, number of septic tanks, and so on, none of which came close to answering the real question; why do people relate to nature in the way they do, and more than that, why do different people relate to it differently? The answers to these questions would have been more valuable (but perhaps less useable) than any amount of impressive data. Yet these answers were elusive.

After a while it became apparent that these answers were important to other questions, like global warming, general `environmental' degradation, and even the Third World debt. It also became apparent that these answers were central to geography, but that few people were asking them.

This dissertation is a continuation of the attempt to answer those pressing questions. It relies entirely on secondary information, but it is the contention of the writer that the analysis of a broad swathe of ideas is more appropriate to the end goal of this dissertation than would be any amount of raw data in a particular sub-discipline that one individual could collect. Indeed the hypothesis is a philosophical one, and is not one which is readily testable through simple (or even complex) quantification. Not only that, but since much of this dissertation is cautious of the uncritical adoption by geographers of assumptions and methodologies which carry with hidden axioms; it would be rather self defeating to then capitulate to the same temptation. Rather it is the synthesis of information from other sources which was, and which should once again be, the trademark of the geographer.

Synthesis is a key concept in this dissertation, although the word is used rarely. Tapestries are woven here, with quotes and opinions from numerous fields; these are the raw data of this exercise. The threads themselves are seldom original, yet it is the choice of threads and the weaving itself which marks the originality of this contribution. This dissertation claims originality in a number of ways. The methodology itself is an attempt to use abstraction to form categories (the paradigms), and to use these categories to look at the larger picture rather than to capitualate to the reductionist tendencies of conventional analysis. Thus the use of paradigms as analytical tools for debate on this scale is original. The hypothesis too is original, that the `environmental crisis' is the inevitable result of the actualization of the assumptions which form the Dominant Western Environmental Paradigm and any `solution' which fails to recognize this is doomed to failure. As a part of this the argument that geography, and indeed science itself, is constrained by the assumptions of the dominant cultural paradigm and is unable to offer a critique of these assumptions, with the result that it is unable to offer any real solutions to the `environmental crisis' is an original one.

In a similar vein, while the existance of an `alternative paradigm' has been noted frequently in the past, the actual description of the alternative and what it must entail has been scanty at best. The originality of the approach as adopted here is evident in that it allows schools like Social Ecology and Deep Ecology to be regarded as parts of a larger alternative interpretations, rather than as (often conflicting) alternatives in themselves. In addition the line between approaches which attempt to patch up problems and those with a sophisticated critique is redrawn. This question of critique is important, it becomes apparent in the progression through the text that the Green Paradigm, while it has gained popularity as a vehicle for criticism, is more that a reaction to a problem. It is a different answer to some of the same questions the dominant cultural paradigm is attempting to answer.

The structure of this dissertation itself is unusual. It is an unfolding; there are few summaries and no charts, tables, or graphs. Although geography is a central theme, few sections are specifically devoted to geography; only at the very beginning and the very end is the connection to geography made explicit. What is important here is the creation of pictures and metaphors, the detail; it is up to the reader to compare them to his/her own experience and evaluate their applicability. Yet at the end the reader should have a mental picture of the direction in which the new geography should be moving, of its new methods and its metaphors, and of its concerns. In this process too this dissertation claims originality; a new direction for geography in a new style; yet this appears to be a return to something much older:

> "One can accept that synthesis can be accomplished by a set of key phrases which embody considerable thought, travel, and study. The phrases in isolation may appear banal, but together they communicate a set of signals to the reader at a level somewhere above or below the logical. They may stimulate an intuitive feeling for the togetherness of events, patterns, and areas....To call this writing and these responses artistic or poetic is surely not to denigrate them. It seems to me that this is what ... geography is" (Curry, 1991, p. 2).

Perhaps geography has moved so far from its original direction that to return thence is an original act.

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Greg Knill, 1992

Contents

Chapter 1: An Introduction to the Issues

Chapter 2: The Roots of the Dominant Western Environmental Paradigm

Chapter 3: Implications of, and Anomalies within, the Dominant Western Environmental Paradigm

Chapter 4: Paradigm Regained: The Roots of the Green Paradigm

Chapter 5: Shades of Green: Constructing a Green Society

Chapter 6: Drawing It All Together

References

Chapter 1
An Introduction to the Issues

Geography and Paradigm Shifts

This dissertation is set within the context of global `environmental' change. The intention is not to enter in to debate on the scope, the scale, or the nature of the change, but to take as given that change is occurring, or will occur in the near future. Of particular relevance is the situation within Third World nations, where social and economic relations often have significant negative ecological consequences, a situation which has been well documented (for example Blaikie's (1984) *Political Economy of Soil Erosion*). Against this backdrop of events which are actually occurring, the question is posed of how geography is responding. It is suggested here that the reaction of geographers to what is popularly, and perhaps accurately, described as the `environmental crisis' is inadequate, often inappropriate, and frequently non-existent. Geographers are simply not examining fundamental questions such as those raised at a meeting of the AAG in 1987: the Malthusian dilemma of whether resources are really sufficient for human numbers and at what cost to the rest of the ecosystem; what will be the result of human transformation of the earth; what is sustainable development really? These are questions which should be central to the discipline, and are derivatives of what may be the ultimate question in geography, and indeed science: what is and ought to be our relationship to the rest of nature? (Kates, 1987).

The reasons for this indecisive response are examined against an analysis of the role of science in society, and of geography in science. It will be argued throughout this dissertation that there are two main competing interpretations of the human relationship to the rest of nature. These different interpretations, which, it will later be argued, are different cultural paradigms, provide science with different roles and responsibilities. This point will obviously be expanded on in much more detail, but in a nutshell it is suggested that the Dominant Western Environmental Paradigm (DWEP) relies on a perception of humans as separate from the rest of nature. The role of science as directed by this cultural paradigm is to support the fundamental axiom, and provide proof of this difference. The competing interpretation, here called the Green Paradigm, relies on a perception of people as part of Nature[1]. The role of science within this paradigm would be to identify appropriate patterns of human behaviour with regard to the rest of nature[2]. Both cultural paradigms contribute to the Western world-view, and exist in a state of dynamic tension. Each perception has a role, in terms of an individual identifying themselves, and in terms of a society identifying itself. It is argued, however, that the uncritical assimilation of the fundamental axiom of the DWEP has shaped the institutional paradigms of science, of economics, and of philosophy, a process which has reciprocally had the effect of shaping Western society, as well as reinforcing and supplementing the institutional and even disciplinary and sub-disciplinary paradigms of its component parts. The axiom of the DWEP has in effect become a self-fulfilling prophesy, and has assumed a dominant position in the Western cosmology. Yet it is argued that the axiom is incorrect, and that the interpretation offered by the Green Paradigm, that people are a part of a system, seems to fit the accumulated information better. More than this, if it is true that people, and society, are a part of a system, then human actions must be expected to have an effect on that system. The `environmental crisis', it will be argued, is a symptom of this impact.

Numerous criticisms have been raised with reference to particular aspects of Western society; some have been accepted and remedied, some have been rejected, and many have been assimilated or colonized. A central theme of this dissertation is that the ever increasing ecological stress which the planet is facing is a symptom of the creation of an entire society on an incorrect axiom. Any remedy which does not have to scope to recognise this as fundamental is thus unable to deal with the root of the problem; it simply does not have a wide enough scope to actually be able to see the real cause, and is necessarily doomed to failure of one sort or another. Science, however, is contextualized within the framework of the DWEP. Geography is contextualized within the institutional paradigm of science. As such it will be argued that geography is unable to respond to the `environmental crisis' in its present formulation. For geography to respond adequately, it will need a new disciplinary paradigm framed within the assumptions of Green cultural paradigm.

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1 For the purpose of this argument, Nature with a capital N is taken to include humans, while the lower case is exclusive

2 The dissertation obviously take the realist philosophical position, accepting that there actually is something out there which is more than the product of a fevered imagination.

INTRODUCTION

The role of geography

It is the contention of this dissertation that geography should be a discipline capable of dealing with real world situations, particularly where they relate to the interface between human and nature. From the perspective of the writer; at the bottom end of Africa looking up, there is a very real need for a science which can integrate changing social, economic, philosophical, and natural systems. This role of synthesis was a concern of geographers in the past, but has been largely left by the wayside. It remains sorely missed.

This assumption raises a number of questions. The most obvious one is whether geographers should seek to apply themselves to real world problems. This question surely can be dismissed out of hand; if geography is not about dealing with real issues, then it has no reason for existing at all, and this dissertation may as well end here. The second question must then be why geographers are not as prominent in the field as they should be. It is suggested here that there are two reasons for this; the historical reaction to environmental determinism which is well documented in geographical literature and which is regurgitated endlessly in Honours level lectures and in the literature reviews of geographical dissertations; as well as a more fundamental problem and one which provides much of the focus of this dissertation, the appropriateness of the view of nature which is held by geographers and other scientists. If science is a product of society, it simultaneously reproduces society (Levins and Lewontin, 1985). If geography is a science, its practitioners must both accept the dominant interpretation of Nature, and reproduce this viewpoint in their scientific work if they are to obtain and retain scientific respectability and credibility. It is suggested that the disciplinary insecurity complex which characterizes geography has stifled work which would challenge this Dominant Western Environmental Paradigm (DWEP), although challenges are being made through other disciplines. It is further suggested that the uncritical acceptance of the DWEP by decision makers such as politicians and business people is to a significant degree responsible for the `environmental crisis' and that geographers will only be able to make a meaningful contribution to dealing with the problem when they are able to step outside this cultural paradigm. In doing so it is to be hoped that geographers will at last be able to take the lead in science, if only because geography is the science with the most obvious social interface. It is suggested that the whole of science, as a product of Western values, is used to legitimise the *status quo*, the domination by the First World not only of the Third World, but of Nature itself. It is hypothesised that the view of nature adopted by those who support the DWEP, that of nature as separate from, and subordinate to humans, has been a significant factor in the domination of Nature which has led not only to capitalism as we know it today, but also to the looming `environmental crisis'; both are manifestations of the maladaptation. A geography which is not critical, or even aware, of the assumptions of the DWEP is significantly limited in alternatives it can formulate or encompass. More than this, it remains a tool of the DWEP and its supporters. If the assumptions of the DWEP have played a part in the increasing ecological stress on the planet, then it would be contradictory for geographers to continue to support them; assuming geographers accept a responsibility for the well-being of the planet. It is suggested that there is a large body of literature which goes some way to answering the question posed by Kates (1987); what is and ought to be our relationship with nature? and that the time has come for a re-formulation not only of geography, but of science and of society in accordance with this knowledge and understanding. A failure to do so would be an indictment of geography and of science itself. It is thus up to geographers to rise to Chomsky's challenge:

> "Consider the often-voiced demand that the University serve the needs of the outside society - that its activities be `relevant' to the general social concerns. Put this way this demand is justifiable. Translated into practice, however, it usually means that the universities provide a service to *existing* social institutions that are in a position to articulate their needs and subsidize the effort to meet them. It is not difficult for members of the university community to delude themselves into believing that they are maintaining a `neutral value-free' position when they are simply responding to demands set elsewhere. In fact to do so is a political decision, namely to ratify the existing distribution of power, authority, and privilege in the society at large and to take on a committment to reinforce it. The Pentagon and the great corporations can formulate their needs and subsidize the kind of work that will answer to them. The peasants in Guatemala or the unemployed in Harlem are in no position to do so" (Chomsky, 1973, p. 89-90).

Indeed the question of for whom research is being carried out must be extended to address to include the welfare of the global ecosystem itself. It is thus necessary to identify the assumptions of the DWEP, establish the viability of an alternative paradigm, and consider the type of geography which would result from a paradigm shift. One can obviously not make sweeping statements like this without providing some indication of what a new paradigm will entail, and it is the description of some of the characteristics of what is here called the Green Paradigm which forms the second focus of this dissertation.

Geography and Nature: the past

For Kropotkin, writing in 1885, geography prosecuted a definite aim; "that of disclosing the laws of development of the globe" (reprinted 1979, p. 10). Yet while Kropotkin's interpretation may have pointed towards the ideal, the situation in Euro-

American geography at the time was rather different. It has been argued that modern geography was to a large degree used to justify the imperialism of the European and American nations (Harvey & Smith, 1984; Peet, 1985; Stoddart, 1987), and that this acceptance of the status quo led to the widespread adoption of conventional geography in schools and universities (Peet and Thrift, 1989). While this served to entrench geography as a field of study, it simultaneously led to the watering down of geographical analysis, leading ultimately to the much maligned and distressingly simplistic environmental determinism which has so plagued the discipline ever since.

The period between the 1920s and the 1950s, (and later in other parts of the world) was one of a retreat by geographers from the conventional position of geography as a science of the study of human origins. Faced with the criticism of environmental determinism, geographers embraced possibilism, a formulation of environmental causation so vague as to preclude systematic, theoretical, or causal generalisation (Peet and Thrift, 1989). While the determinism debate may appear trite in comparison to other more recent debates which have shaken geography, its effects were far reaching in discouraging geographers from involvement in what should be the core of their discipline; the human-nature interface. Indeed geographers went to great lengths to avoid entering the determinism - possibilism fray, and chose instead to restrict themselves to a study of either human or non-human systems and readily labeling themselves human or physical geographers. One of the main reasons for this was the collapse of colonial system and a change in attitude of the ex-colonizers as the newly independent states increasingly asserted that colonial exploitation rather than environmental limitations were responsible for their underdevelopment. This resulted in a loss of popularity for environmental determinism, as it was increasingly associated with colonialist and indeed racist attitudes. The result was that geographers who were involved in research in the Third World simply avoided the human-nature interface entirely (Dodson, 1989).

A second factor which decimated geography was the quantitative revolution. Given that the discipline was in a rather parlous position in regard to its standing as a science, it is perhaps understandable that geographers rushed to adopt quantification as the new badge of scientific credibility. The result was that methodology came to transcend the importance of the subject matter, and geographers seemed more concerned with displaying competence in quantitative techniques than fulfilling their traditional role of describing and explaining the world around them. The search for quantifiable generalization caused geographers to ignore the infinite variety of the world (Dodson, 1989).

It was not long before the validity of quantification and its associated positivist philosophy was challenged, but the challengers seldom proposed a reintegration of geography, proposing instead a human geography almost entirely divorced from its physical context, and based in approaches like behaviouralism and phenomenology which brought it closer to other social sciences (Gale and Olsson, 1979; Relph, 1981). For their part physical geographers raised little protest (Dodson, 1989).

Radical geography originated as a critical reaction to what were seen at the time as crises of capital; the armed struggles in the Third World, particularly the US involvement in Vietnam, and the emergence of urban social movements with the civil unrest which marked cities in the US and Britain, as well as elsewhere (Peet and Thrift, 1989). Although radical geography flirted briefly with notions of anarchism and the environment, particularly the special issue of *Antipode* in 1979, it soon focused on, and to all intents and purposes became, Marxian if not Marxist. In adopting the Marxist interpretation of human-nature interactions (although there is considerable debate on what this interpretation is), Marx-based radical geography cut itself off from alternative thinking as surely as mainstream geography had done just a few years beforehand. This point will be expanded on in more detail in Chapter Four.

Nevertheless, it is probably a fair comment to say that the history of geography has not been one of unity. What at first looked like a distinct discipline with an obvious research agenda slowly vanished like morning mist as time moved on. The social revolution which marked the events surrounding Earth Day 1970 should have been an obvious place for geographers to display their social relevance. As Kates (1987) noted, there was no discipline better situated to provide the intellectual and scientific leadership needed. The obvious can candidate for the scientific leadership of the environmental revolution should have been the science of the human environment; geography. Instead this leadership was spread and diluted among biology, economics, and engineering; all of which brought their own theories of nature, and none of which offered a truly integrative view. Will geographers allow this to happen again?

Geography and Nature: the present

In the introduction to *New Models in Geography* (1989) Peet and Thrift note that the book does not contain any work by physical geographers. They explain this by suggesting that human and physical geography have drifted apart, that human geography now lies firmly in the camps of the social sciences and the humanities, with a one line lament for the fragmentation along with the almost traditional prophesy of good times and unity just around the corner. This is all very well, but it does not help physical geographers deal with the social analysis of the very real environmental problems. Indeed from the perspective of physical geography, human geographers appear to have pursued their ever more specialized fetishes in ever decreasing circles, until they ultimately vanished from the debate altogether. It is thus interesting to speculate on whether it will ultimately fall to physical geographers to re-invent a human geography which again examines the human-nature interface.

For the rest, geographical journals are publishing numerous articles devoted to the breast-beating and soul searching of lost geographers. Yet there has been a change in tone over the last few years. Where in 1973 geographers were accused of behaving like "a persecuted religious minority" (Farmer, 1973) and in 1987 were described as "despondent, morose, disillusioned, almost literally devoid of hope, not only about Geography as it is today, but as it might also be in the future (Stoddart, 1987, p. 328), today there is more fighting talk. Leslie Curry can confidently state in a guest essay to *The Canadian Geographer*:

> "Geography is about places and the people of places, how people interact in a place and between places. It is locational; this is its appeal and its purpose. It answers a fundamental human curiosity. No other discipline has this guiding motif; how places work, how they change, how they can be manipulated. Areal differences, areal structures, spatial processes and behaviour are where we are at. Only an idiot, or an Ivy League-trained dean could deny the fundamental intellectual need for geography"(1991, p. 2).

Yet Curry notes that not only is the current state of geographical theory piecemeal at best, but also that no-one seems to take seriously the notion that geography needs its own special body of theory.

> "A subject without its own type of explanation is not a discipline, it is a draughty corridor in which encounters are brief and by chance...[but] we lack the means to provide an integrative role. Geography has not yet received the enrichment in its own terms that should come from theory" (1991, p. 5).

The question, of course, is what this theory is. On this there is less agreement. Claims are being made for the unity of geography, but one of the original reasons for its separation was the lack of a unifying theory, one which could be used by all geographers. This problem does not appear to have been solved. If it is not solved, the question must be asked whether there really is unity at all. This is not the same thing as recognizing the need for unity, however.

There are different attitudes towards the question of unity. There is certainly a strong school of thought which argues for unity; indeed argument against unity seems almost non-existent at present. Nevertheless, given that some sort unity is necessary for the maintenance of a disciplinary identity, and thus a continued presence in schools and universities, not to mention continued funding, this should surprise no-one.

There are attempts at playing devil's advocate (Johnston, 1986), but these seldom seriously suggest that geography disband. Johnston, who has in the past had a reputation (deserved or otherwise) of being in favour of the human-physical split, gets around this issue by distinguishing between academic and vernacular geography, pointing out that no human geographer would deny the necessity of taking the physical environment in to account, and that all physical geographers must recognise the impact of human activities, and that as a result of this they need the vernacular knowledge of one another, if not the academic (1986). This looks a bit like verbal gerrymandering, although Johnston concludes that what is needed is a unity based on holistic viewpoints of environmental and social science. Johnston has more recently produced a book which points out, in great detail, the interconnection of ecological and socio-economic issues (Johnston, 1991, repr. of 1989). Yet here too he effectively denies the theoretical unity of the discipline by falling back on the academic-vernacular distinction. Not surprisingly, the last chapter, on the alternatives for the future, is somewhat lacking in direction.

Yet while some human geographers dither and prevaricate, there are others, particularly physical geographers, for whom the issue of unity is vital. Goudie (1986) lists what he calls an outpouring of work by physical geographers seeking to explore the interface between human and nature, and he notes that environmental changes and impacts bring geographers in to contact with fundamental world problems like acid pollution, desertification, climate change, carbon dioxide pollution, extinction, deforestation, soil erosion, pollution, and so on. It would indeed be ironic for a subject which claims G.P. Marsh and C. O. Sauer in its lineage to ignore such fundamental concerns (Goudie, 1986). Yet where Goudie (1986) argues against the fragmentation of geography on the grounds that it would be prejudicial to its vitality and even its continued existence, to say nothing of going against many of the traditions of geography and reducing the contribution geographers could make to the examination and solution of fundamental world problems caused by increasing human pressures on nature, he can do little about pointing geography in this unifying direction as far as theory is concerned. All he does note is that he would not suggest that unity be based on shared technique or method (Goudie, 1986).

> "Geographers concerned with rural development in the Third World have no difficultly in perceiving the unity of their discipline. International biological and ecological projects have emphasized the inter-dependence of environment, people, and technology in rapidly growing low-latitude cities. Answers to the complex problems of such communities will not be found by a partial investigation from the standpoint of a sector of a

> discipline or any other selective approach based on western paradigms... . More geographers should be active in the big, fundamental issues in which the unity of geography is obvious" (Douglas, 1986, p. 459).

There is a call here for geographers to get their hands dirty in taking up some of the real challenges facing the planet, and a conviction that in those issues there is no question about the unity of geography. Geographers have largely ignored the issues of world inequality, or have taken it up at a microscopic level, leaving it to the political scientists and ecologists to attempt to draw their separate pictures (Douglas, 1986) This is a call echoed by others intimately concerned with issues of life and death.

> "Quite frankly I have little patience with so-called geographers who ignore these challenges. I cannot take seriously those who promote as topics worthy of research subjects like geographic influences of the Canadian cinema, or the distribution of fast-food outlets in Tel Aviv. Nor have I a great deal more time for what I can only call the chauvinist self-indulgence of our contemporary obsession with the minutia of our own affluent and urbanised society ... . We cannot afford the luxury of putting so much energy into peripheral things. Fiddle if you will, but at least be aware that Rome is burning all the while" (Stoddardt, 1987, p. 334)

But then Stoddardt had a very real concern with life and land in Bangladesh, not to mention the potential impacts on the low-lying nation of sea level rise. For him, land and life is what geography is all about (1987). Yet counterpoised to this call to arms come comments like: "We cannot all act as the Red Adairs of the total environment, rushing to crises and averting disaster at the eleventh hour" (Graham, 1986, p. 465). Certainly there is no danger of all geographers rushing to do so; in my experience I can scarcely think of a group less likely to act as Red Adairs. And perhaps this too is a problem, perhaps there is a large degree of unwillingness on the part of geographers, as much as other scientists, to actually get involved. To translate the events on paper into real action. Perhaps Graham is correct in suggesting that we cannot all leap into the fray, but it would be useful if someone would.

There is a slow recognition among some radical geographers that the separation of human geography from explicit ecological concerns has become ridiculous. They recognise the paradox of human geography's abandonment of environmental sensitivity at the same time as it is rediscovered by society. Yet while some call for a bringing together of the issues of society and environment, they do so under the banner of a 'Green human geography' (Lowe and Short, 1990), which unfortunately suggests that they have missed the point entirely.

THE GREEN PARADIGM

Geography in South Africa

Given that there is an active community of geographers in South Africa, and given too that the country straddles the First World-Third World divide, it would not be unreasonable to expect a significant amount of geography applied specifically to the question of the human-nature interface to exist there. This might not be an unreasonable assumption, but it would be an unrewarded one. South African geographers have for many years operated within the apartheid system, and this has led to the emergence of two distinct schools. Those who have actively criticized the system, and those who have either co-operated with it, or who have retreated into the safety of `value-free quantification' and have thus avoided having to say anything about the system. That they have been able to do this is more a symptom of the various traditions within geography than of inherent evil or lack of concern. One of the feminist critiques of science is that the `value-free' myth attracts those who do not want to confront value laden issues, a point expanded on in more detail in the third chapter. Given the four traditions of geography; earth, place, space, and environment (Kates, 1987), this has meant that the discipline has provided room for both the socially concerned and the socially illiterate. The extreme polarization of South African society is only now beginning to thaw, but in the past meant that the two poles had little in common, and indeed seldom communicated at all. This was more than a simple human-physical split, it was a division along the lines of quantification vs critique. Within this division, it is certainly true that those who saw themselves as physical geographers tended to side more with the quantification culture, though this was not necessarily so. On the other hand, there were (and are yet) a number of human geographers whose work "legitimised (sic) South Africa's heinous geography either by pursuing purposeless descriptive meanderings, or more dangerously, through the implicit or explicit endorsement of the language and praxis of apartheid" (Rogerson and Parnell, 1989, p. 13).

The `environmental' issue has received very little academic attention in South Africa, not least because it uncomfortably straddles the human-physical, as well as the quantification-critique divides. From the perspective of those geographers in the school critical of apartheid, the interface between nature and society was not a research priority, and was indeed often seen as an attempt to ignore the pressing issues of the day. For those still clinging to the myth of value-free science, it perhaps asked too many questions. And it must not be forgotten that up until very recently the English speaking universities in South Africa were under a state of siege, both literally and figuratively. The same year which saw police teargas cannisters being fired into our honours study at Wits also saw a colleague's seminar on soil erosion and climate change receive a snarled comment "I'm surprised you haven't also blamed the drought on apartheid" from a senior member of the department. Armoured personnel carriers, tear gas, baton charges, police dogs, sjamboks, helicopters, and, more rarely, live ammunition, were very much a part of academic life. Those who were socially concerned and aware exhausted their energy against apartheid. The rest stared with interest at the side of the road. For the concerned, and this included those concerned about an academic boycott, this was not a period for anything which could be construed as fence-sitting.

The net result of this situation was the emergence among the socially aware geographers of an attempt to be relevant to the issues of the day. Geographers felt inadequate in matching the impressive and apparently coherent progressive research agendas which emerged in other academic disciplines like history (Rogerson and Parnell, 1989). In attempting to correct this imbalance and to move towards a people's geography, progressive geographers adopted two slightly different trajectories. The first was an attempt to decolonize the research agenda by using historiographic techniques focussing attention on the excavation of the historical processes which gave rise to the discriminatory practices of apartheid. The second focus what a laying of stress on heightening the "political knowledge of geography" (McCarthy, 1985, p. 178), with cues being taken from the agendas of progressive political organizations. While this should theoretically encompass Green activism, the emergence of such activist organisations is apparently too recent a phenomenon to have had any effect on the research agenda in progressive South African geography. Instead the focus is more on community organizations and labour movements, and on visions for a post apartheid South Africa (Rogerson and Parnell, 1989). There is a measure of agreement among progressive human geographers that urbanization is, and will for a number of decades remain, the most powerful process affecting the interests of those represented by the progressive political organizations (McCarthy and Wellings, 1989; Rogerson and Parnell, 1989). The result of this interpretation is that the key challenge for the future is seen as being the formulation of a democratic vision for a new metropolitan order in a post apartheid South Africa, and it is on this that concerned geographers are pursuing their most vigorous research endeavours (McCarthy and Smit, 1988).

There is a singular absence of academic writing which focuses on the human-nature interface. The impact of worsening rural impoverishment under apartheid and the resulting inabilities of the homeland or Bantustan communities to deal with natural hazards such as droughts has been documented (Freeman, 1984, 1988). For the most part, however, has environmentalist writing has been without social commentary, concentrating on techniques for impact assessment and the legal and technical sides (e.g. Fuggle and Rabie, 1983). Indeed the field is sparsely populated by geographers. A very popular (and highly publicized), if naive and irritating little book, *South African*

Environments into the 21st Century (Huntley, Siegfried, and Sunter, 1989) was in fact produced by a botanist, an ornithologist, and, of all people, one of the directors of Anglo American, South Africa's largest multi-national. Not surprisingly the message contained in this book was that economic growth is the only way out. More recently a sociologist has produced an alternative perspective on the issue (Cock, 1990), but again the style is journalistic and popular rather than academic. Indeed it would be fair to say that there has as yet been no serious, critical, academic work produced on the human-nature interface by geographers in South Africa One might go further and say that if any has been produced in other fields it has not filtered through to geographers yet. Since the whole of South Africa's academia suffered the same apartheid induced stresses on the research agenda, there is little reason to believe relevant critical work has been done in other disciplines.

Is there a paradigm shift in geography?

The question of a paradigm shift is a very contentious one, not least because there is so little clarity around the term itself. It is one of those words which everyone thinks they understand and thus do not need to define. Worse than that, it is a particularly flexible term, and can be used in an almost infinite number of situations. The net result has been the erosion of the usefulness of the word to the point where it is, by itself (that is, without qualification or definition), completely useless.

This is unfortunately not sufficient to dissuade people from using the term without clarifying it first; even people who should know better. In their chapter on processes and metaphors in evolution, for example, Ho and Fox (1988) comment that some see, in the critiques of Neo-Darwinism, the emergence of "a new paradigm, according to Kuhn's (1962) own definition" (Ho and Fox, 1988, p. 13). A look at their reference list reveals that the book cited is referenced as the second edition. This is unfortunate, since the second edition was only published in 1970. The question of paradigms will be expanded on in more detail later, but the point here is that it is a particularly complex issue, and one which is consistently skimmed over by people who think they know all that sort of thing, or who simply have not had the time to actually read either or both of Kuhn's (1962, 1970) editions. If they had, they would realise he did not offer a single, useful, definition.

There is a vernacular interpretation of a paradigm shift which equates it with "a sea-change in the consciousness of an age" (Ogilvie, 1981, p. 265), and it is this interpretation which is the most commonly held understanding of the term. The vernacular interpretation has its uses as a broad brush, although it is not a sufficiently rigorous definition for the purposes of the argument developed later in this dissertation. Indeed strictly speaking, it could be argued that the sea-change is the crisis which forms part of, but which precedes the real paradigm shift. Using the vernacular definition, however, the question could at this point be posed: `is geography responding to this sea-change?' For some it is; Dodson (1989) specifically notes a disciplinary sea-change in a return to a traditional geography; a change which she notes is more timely than revolutionary (which means it is not paradigmatic), a return to what she calls Neo-classical geography. A geography based, as it was in its history:

> "firmly in the man-environment (sic) paradigm, seeing that paradigm not as one subdiscipline within geography, but with Brookfield, as `the real "mainstream" of geography', albeit a `braided [rather] than a meandering mainstream' (1984, pp. 37-8)".

Herein lies the rub. For geographers a paradigm shift is the creation of one geography out of several. This is really more of a disciplinary adjustment than it is either a disciplinary revolution, or acknowledgement of changes within science itself. The use of the word paradigm seems simply to add confusion to an already confused situation. The principle philosophical question being asked by geographers at the moment is centred around the issue of unity. Indeed it appears that the unity debate is the only real discussion going on as far as the future of geography is concerned. This is not entirely unexpected; those philosophically inclined geographers are so excited about the possibility of finding some unifying aspect to their discipline that they have not even considered the possibility of a relocation of the discipline. The larger context of the direction of science, or even of that new geography, has received little attention.

On the other hand there has been a significant quantity of research on questions such as the appropriateness and direction of science taking place outside of geography. Sufficient work has been done in disciplines as disparate as literature (e.g. Ogilvie, 1981), anthropology (e.g. Ingold, 1986, 1987), physics (e.g. Bohm, 1980), philosophy (e.g. Lee, 1989), and biology (e.g. Ho and Saunders, 1984; Levins and Lewontin, 1985; Ho and Fox, 1988) focussed either specifically or contextually on the question of the human-nature interface for the existence of an alternative paradigm, at least in the vernacular sense, to be old hat.

Geographers seem curiously immune from these tides which are washing around the very foundations of their discipline. In his review of Peet and Thrift's *New Models in Geography* (1989), David Harvey comments that:

> "The time is surely now for a whole new look at the relations between ecology, environment, and political-economic perspectives in geography and this challenge is not taken up" (Harvey, 1990, p. 376).

Ian Simmons is one of the few geographers who have specifically suggested that Green ideas are an appropriate field of study for geographers. Yet while he proposes a

Greening of geography, he does so without apparently calling for, or noting, a paradigm shift. The idea of what Green means is not developed to the extend where it is presented as a completely different framework for analysis. Instead it appears more as a new set of concerns. This is not to say that Simmons is unaware of the trends around the question; he notes, for example, that it would not be unreasonable to see environmental science as just one of a number of possible sets of constructions (Simmons, 1990a). He similarly notes the need for a critical examination of some of the assumptions made around the question of human-nature relations (1990a, b), and introduces into the debate the question of normative behaviour; given that there are alternatives, does geography have a role in determining an appropriate relationship with nature (1990b)?

For the most part, however, even this call for a greening of geography is little more than a return to a modified examination of the implications of human domination of the planet. It contains an implicit acknowledgement of at least a sea-change, but the implications are not ever really articulated although admittedly these are two rather short pieces. Johnston (1991) reports that Simmons presented a paper at the IBG Annual Conference where he argued that natural environments have now disappeared, and we are left with nature as a social construct in more ways than one. The result of this is that there are no environmental equilibria, and the prediction of environmental change has been rendered impossible. This is clearly a call to human geographers to at least start noticing the issues. Yet even at this august gathering of geographers, where calls for geographers to get involved, to even be activist, were apparently common, Johnston (1991) does not note any sign of what could be described in any sense as a paradigm shift.

Perhaps the clearest comment on paradigm shifts in geography is to be found in a satisfyingly quantitative and statistical analysis of geographers listed in the Science Citation Index and the Social Science Citation Index (Bodman, 1991). Although Bodman (1991) notes a shift in emphasis from the types of articles cited in the 1970s to the 1980s he ascribes this to the declining importance of quantitative, locational, or behavioural geography rather than a new direction in geography.

> "Taken together with the changes in individual citation counts, the weight of evidence points to considerable structural change in human geography. There has been no scientific revolution in the Kuhnian sense in the past fifteen years (Kuhn, 1962). Instead, the shifting balance of activity and influence in this period is more adequately captured by the models of scientific change put forward by Kroeber (1957) and Toulmin (1967). Change in human geography has been evolutionary; there has been no revolutionary episode" (Bodman, 1991, p. 28).

INTRODUCTION

Bodman (1991) notes that physical geographers are cited very rarely in comparison to their human counterparts. What he also finds interesting is that many of the highly cited physical geographers are over 60 years old, and that in the top ten most frequently cited authors, only Goudie is representative of the post-war generation; suggesting that younger physical geographers have difficulty dislodging the entrenched leaders. He further notes that in contrast to the high turnover of references in human geography, a significant proportion of literature cited by physical geographers is twenty or thirty years old, a reflection, he feels, of the settled nature of the research agenda in physical geography (Bodman, 1991).

Not only does this statistical analysis indicate a lack of significant change in geography, with physical geography changing more slowly than human, but other studies indicate geography has little influence on other disciplines. Laponce (1980) concludes geography to be almost wholly isolated, based on an examination of the relationships between political science and cognate disciplines conducted through analysis of the import and export of citations. Others suggest that geography, in the United States of America at least, borrows extensively from other social sciences, but has almost no influence on them (Bodman, 1986).

It would be wrong to place too much importance on such statistical analyses of citation records, but examined in concert with information presented earlier in this chapter, it is possible to see the development of a picture of the discipline. Nor is this a pleasant picture; an intellectual backwater spiraling round and round, its surface crusted with the debris of decades, and only the merest trickle of fresh ideas keeping the discipline moving.

Geography is not leading the field. Even if it were to re-focus around a human-nature interface, this would amount to a disciplinary reshuffle, and one which is only peripherally connected to the sea-change occurring within science itself. It would not be a revolution of the size needed, indeed it is hardly revolutionary. And yet evidence suggests that even this minor adjustment is not being welcomed by all geographers. It is suggested that geography needs a massive injection new thinking; geographers need to take note of the shifting currents in the world of science and of nature. This is not to suggest that all geographers should study the same thing; it is pluralism of geography which is its greatest virtue and its strength (Kates, 1987). There is still scope for, and a need for, most of the traditional areas of concern of geographers. Instead geography needs to shift its entire framework. Geography should have a central role in providing science and society with information on what the world is really like. It simply cannot do this if its framework for analysis is flawed. Geography needs a new paradigm, one set within a self-conscious attempt to find an appropriate relationship between society and Nature, a disciplinary paradigm set within the framework of the Green (cultural) Paradigm.

The notion of paradigms and paradigm shifts is clarified for the purpose of this argument, and by way of introduction. The interpretation and use of the term for the purpose of this dissertation is explained later in this chapter. A discussion of the roots of the DWEP is held in chapter two, during the course of which the scientific, religious[3], and philosophical support for the DWEP is examined. The psycho-sexual roots of the DWEP are also exposed in the course of this chapter. Within chapter three the questions of evolution vs development. scientific rationality, value, and economics are identified as anomalies within the DWEP, and the implications of these anomalies are discussed. It is argued that the anomalies are too profound for the DWEP to accommodate, and that a revolution which will ultimately lead to a paradigm shift (in terms of the definition used in this dissertation) is occurring as a result. The features of the Green Paradigm are established in chapter four, through an examination of its roots. Interpretations of the Green Paradigm as it is found within the schools of Social Ecology, Deep Ecology, Eco-feminism, and supporters of the Gaia hypothesis are presented in chapter five. These schools are chosen because they result from deliberate attempts to create systems of thought explicitly based on the perception of people as a part of Nature; they are in effect intended as social or scientific models of the Green Paradigm. These interpretations are analyzed briefly, and some of the implications of a paradigm shift are identified. It is suggested that none of these interpretations or articulations of the Green Paradigm is sufficiently developed or broad in scope to be seen as truly representative of the Green Paradigm; it could not be argued, for example, that Deep Ecology is Green but Social Ecology is not. Instead it is suggested that when put together they form a more representative picture, and that trying to decide between them is missing the larger point. Chapter six hosts a debate which seeks to draw together the arguments and the compromises introduced throughout the thesis and to present a likely compromise as a conclusion.

Paradigm Lost; Paradigm Regained?

As a technical term, `paradigm' is used casually and without academic rigour. Like `Holism', it has been reduced to little more than meaningless jargon. It is, however, a complex and very useful term, and on some scales it provides a mechanism for appreciating the effects of an idea in ordinarily incomparable fields; romantic poetry and quantum theory, for example. Because of the confusion surrounding the term, it is necessary to explain here how paradigm is interpreted in this paper.

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3 Limited here to Judeo-Christianity

INTRODUCTION

Thomas Kuhn, who appropriated the term `paradigm' from the Greek `paradigma' (a model) in his book *The Structure of Scientific Revolutions* (1962) saw sciences at any period as being dominated by a specific paradigm, which would go through a life cycle. During the period of *normal* science, knowledge would be collected in order to explain and refine the ruling paradigm. This process would naturally reveal *anomalies* which could not be explained within the existing framework, and the framework would attempt to adapt to incorporate the criticisms. If the dominant paradigm were unable to offer satisfactory explanation, this would lead to a *crisis*, and finally a *paradigm shift*, or *revolution*. For the purpose of this dissertation a paradigm is taken to be:

> "a fundamental image of the subject matter within a science ... which serves to define what should be asked, and what rules should be followed in interpreting the answers obtained" (Ritzer, 1975, p. 7)

This interpretation is a refinement of Kuhn's

> "Universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners" (1970, p. viii).

By itself, however, this definition is insufficient in that it does not acknowledge the different scales of paradigms. In taking this interpretation, Kuhn was limiting paradigms to science, at a disciplinary or even sub-disciplinary level. He specifically proposed the existence of paradigms which he sees as possibly far more specialized than even, for example, wave optics. It is the study of paradigms, Kuhn suggests, that prepares a student for membership of a particular scientific community in which they will later practice. In his 1970 book Kuhn added a postscript which acknowledged that the term paradigm had been used in two senses in the 1962 version. He admits that on the one hand:

> "...it stands for the entire constellation of beliefs, values, techniques, and so on shared by the members of a given community" (1970, p. 175)

and on the other:

> "...it denotes one sort of element in that constellation, the concrete puzzle-solutions which, employed as models or examples, can replace explicit rules as a basis for the solution of the remaining puzzles of normal science" (1970, p. 175).

It is obviously problematic having a single word to describe very different scales of thought. This is compounded by Kuhn's insistence that the community to which he referred was that of science and scientists. It is, however, a legitimate extrapolation to expand his former definition beyond such a limited sense of community.

THE GREEN PARADIGM

It has been suggested (Satterfield, 1983) that at its upper reaches the cultural paradigm (being the paradigm of the broadest scope) begins to merge with and become indistinguishable from, ideology. The questions which an ideology seeks to answer:

1. Where did I and my society come from?
2. Who am I and what is my society?
3. Where are my society and I heading?
4. What is right and wrong? (Kinloch, 1981)

are questions which occurred regularly within the course of this investigation. The existence of these questions is perhaps more central to this dissertation than is an attempt to answer them, but it is worth noting their relationship to Kates' (1987) earlier question of the appropriate way of relating to nature and the role of science in answering this. At the very least it suggests that, far from being isolated from the values of society, science has an active role in shaping them. Many of the axioms of the DWEP have been included in the Western ideology, which is not unexpected since an ideology is composed of cultural paradigms. The ideology *per se* is not, however, a focus of concern in this dissertation.

Nevertheless, at a certain level the boundaries begin to get blurred, and cultural paradigms and ideologies merge with cosmologies, in the anthropological sense of `world-view'; the way in which life is perceived. A cosmology is the sum of any given society's interpretations of life and their place in the universe. Again it is obvious that this raises questions which are also asked in the formation of cultural paradigms. It is argued that the question of the appropriate relationship between people and their environment can be regarded as a cultural paradigm in that it is composed of institutional paradigms such as those from science, religion, and philosophy, for example, and also that the cultural paradigm forms a part of an ideology and a comology. Western society possesses two main interpretations of the human-nature interface, which are characterized in this dissertation as the Green Paradigm and the Dominant Western Environmental Paradigm. Although both form a part of the Western world-view, the picture is dominated almost entirely by the DWEP. This has meant that the institutional paradigm of science has in effect become the cultural paradigm of Western society, as well as its cosmology. In a society with a better balance between scientific and spiritual the cosmology would reflect aspects of both the scientific and spiritual (institutional and cultural) paradigms. This absence of a balanced cosmology in Western society has meant that it has fallen entirely to the institutional paradigm of science to answer the questions about society which Kinloch (1981) posed earlier. It has also meant that science, which is after all more a method than an ideology, is without a firm sense of direction; it is no longer clear what interests or ideals science is meant to serve. Means have necessarily become ends. Given that a discipline might be expected to take its cues for directions from the cultural paradigm, this lack of clear direction poses a particular problem, because it is neither practical nor desirable for every scientist to have to analyse the direction of society, their discipline, and the philosophy of science itself before they can begin an investigation. While there is certainly a responsibility on the part of the individual scientist to ensure that the research is beneficial rather than destructive, there are some things it is necessary to take for granted; that science is moving in an appropriate direction, for example.

The importance of a cultural paradigm lies in both its scale and its invisibility. In contrast to a model, which is a deliberate, and recognizedly artificial aid to understanding, the construction of a cultural paradigm is generally not a conscious process. Nor is a cultural paradigm recognized as providing an artificial frame of reference; its assumptions are accepted as valid by those working within the paradigm. The cultural paradigm consists in a set of mutually supporting assumptions about the nature of reality. Given the increasing specialization of science, such assumptions need not necessarily be valid provided they can gain support from outside the field of experience of the investigator (Knill, 1991a). It is suggested that this acceptance of the DWEP as the dominant cultural paradigm has had effects which are visible in areas traditionally studied by geographers (viz. the `environmental crisis'), but that unless geography can shape and adopt a disciplinary paradigm based on a different set of assumptions, it will never be able to truly grasp the scale of the problem, nor will it be able to deal with it. On the other hand, the adoption by geography of a different disciplinary paradigm, based outside the existing cultural one, could have a significant impact on science and on society.

Beneath the (institutional) scientific paradigm, there are disciplinary and even subdisciplinary paradigms. These are dominant models and perceptions used to guide workers in a particular field. A discipline draws its sense of identity from the dominant scientific paradigm. In periods of normal science it reinforces this paradigm. In periods of crisis it may produce anomalies which could lead to a paradigm shift, either in the discipline, or in the whole scientific paradigm. While these levels have been explained in such a way as to appear hierarchical (subdisciplinary, disciplinary, institutional, cultural, cosmological) they are not so in real life, where a continuum, or even a circle, might be a better interpretation. Certainly the degree of feedback between the various levels should not be underestimated. Indeed paradigms can be understood to articulate on one another, not only on different scales but also on the same scale; science drawing support from philosophy, for example. This articulation of paradigms is a central analytical tool in this dissertation.

THE GREEN PARADIGM

This set of different sized paradigms creates problems of its own. When people refer to a paradigm shift, it is seldom clear at what scale they are talking. A paradigm shift in geography is very different to a paradigm shift in the whole of science. Nor are they necessarily directly proportional; it would be quite possible for a shift at one scale to go unnoticed at another. More dangerously, people may assume that because they have already been through one paradigm shift, they are at the same point as everyone else. For example, if geography were to unite around a particular direction, this might be classed as a disciplinary paradigm shift - certainly there is little doubt that it would be hailed within the discipline as being a paradigm shift. Yet is need not necessarily be the same direction as a simultaneous shift taking place in science. This would create a confusing situation where scientists, as a whole, were all aware that they had experienced a paradigm shift, and yet they might not realize they were not in the same place.

It has been suggested widely that a shift in environmental perception is occurring. A "New Environmental" (Catton and Dunlap, 1978), or `Green' paradigm has increasing recognition and support (Cotgrove and Duff, 1980; Devall, 1980; Dunlap, 1980; Ogilvie, 1981; Dunlap and Catton, 1983; Satterfield, 1983; Buttel and Humphrey, 1987; Goodrich, Taylor, and Hobson, 1987). In the complex nature of paradigms, the perceptions of the DWEP are being challenged, and this is having repercussions both in the Western cosmology, within science, and within disciplines. The Dominant Western Environmental Paradigm is so firmly entrenched within the Western world-view that it has only recently been recognized as being paradigmatic at all (Catton and Dunlap, 1978, 1980), although at present it remains largely inseparable from Western cosmology. This difficulty is to be expected as the nature of a cultural paradigm is such that a shift must be discerned in a number of disciplines to be considered paradigmatic. The rise of the Green Paradigm may be traced in literary criticism and psychology, (Ogilvie, 1981), in philosophy of science and social theory (Capra, 1982), and it is implicitly accepted in geography (Fox, 1989a,b, 1990; Buttimer, 1990). Yet there is more to a paradigm shift, on any scale, than recognizing that there are anomalies in the existing paradigm. The idea that there is a tension between the perceptions of people as a part of nature and people as above nature is not a new one, and there have been various attempts to deal with this tension. Teilhard de Chardin, for example, saw the relationship as dialectically phenomenological (although he avoided using the term dialectical) in his attempts to bring together science and religion (Rideau, 1967), and the relationship between these two perceptions of the human place in nature is a central one in self-awareness on an individual scale as well as a social one. By and large too many writers have noticed anomalies in various paradigms, or have noticed that there are competing explanations for some problem, and have immediately predicted or identified paradigm shifts without clarifying quite what they mean. What is important is the need to explain the necessity for this paradigm shift, how the shift may occur, and the implications of such a revolution. It is the contention of this dissertation that there are two cultural paradigms in Western society; the Dominant Western Environmental Paradigm, and the Green Paradigm. They differ in their interpretation of the human-nature relationship. It will be argued that geography has uncritically adopted the assumptions and the research agenda of the DWEP; namely that nature is subordinate to humans and that the role of science is to enhance human control of nature. It will further be argued that these assumptions are incorrect, and that the pursuit of goals formulated within the DWEP has led to the present situation of significant ecological stress being placed on the planet. It is suggested that if geography, and indeed the rest of science, is to produce solutions to this situation, attention must be focused on assumptions and goals formulated within the DWEP.

The Green Paradigm offers a framework which is internally coherent and is able to deal with problems which are anomalies for the DWEP. The Green Paradigm is formulated around the assumption that people are a part of Nature, and it follows that the role of science within this paradigm is to determine appropriate and responsible relationships with non-human nature. It must, however, be repeated that identifying different paradigms does not mean that a shift has occurred; the DWEP remains the dominant interpretation in Western society.

The Dominant Western Environmental Paradigm

The chief scientific characteristic of the DWEP is its atomic model of reality, a model which, it could be argued, is a result, and indeed an articulation, of the assumption that people and nature are separate things. Within this model Nature is necessarily seen as something that can be broken down into identifiable entities. In the DWEP nature is considered subordinate to the needs, and even the whims, of humans. As a corollary to this anthropocentrism the notion exists that people are sole controllers of their own destinies and can do whatever they wish. The uncritical acceptance of the DWEP as a context for human society has lead to the perception that the vastness of the world provides unlimited opportunities for people. It can also be legitimately argued that these opportunities are not for all people. The DWEP is a specifically Western paradigm. It is no coincidence that one of the more common attempts at legitimizing colonialism was the argument that non-European races were somehow less human, more animal; closer, in fact, to nature. Dominating them was simply an extention of the notion of dominating nature (Barzun, 1958). This assumption of inferiority on the grounds of closeness to nature exists today in many arguments for racial, cultural, and sexual superiority. In a disguised form it is at the core of the assumption that development proceeds along a single path, with Western society as its highest form. These arguments will be developed more fully in the course of the discussion.

Most importantly, the perception that human history is one of growth and problem solving has been adopted as one of the tenets of the DWEP, and is generally accepted as a fact, not an assumption. This assumption has been extended to the notion that every problem is soluble, and that progress must necessarily be growth; growth which need never cease (Catton and Dunlap, 1980). This growth/progress is assumed to lead away from nature. This movement away from nature is regarded as inevitable, which is at least in part why science fiction films and books portray the future as a world covered in cities, with no place for nature (even when they recognise the consequences of this alienation, for example as in *Robocop*). Within the DWEP there is no notion of a responsibility to anything non-human, not even to the life-support systems of the planet itself - at least not before human life is threatened. It has been suggested that the model of progress which characterises the DWEP is the result of the congruence of three ideas:

> firstly, the logic of capitalism based as it is on accumulation and maximisation;
>
> secondly, the logic of industrialism, based on an ecologically insensitive science and technology; and
>
> thirdly, the logic of economic thinking which focuses almost entirely on improving economic efficiency (Lee, 1989).

There is a central theme which underlies all of these ideas, the separation of human from nature. And more important is the articulation of this idea; its equation with power, power to destroy and control. Lee (1989) sees the restless spirit of capital, which necessarily must seek more and more profits indefinitely, finding a perfect ally and a reflection in the philosophical attitude of dominance and hostility to Nature, one generated by the new science and technology. Lee (1989) is perhaps too sweeping in his condemnations, but there is more than a grain of truth in his statements. The assumptions of the DWEP are most clearly articulated by those in, or seeking, power. Its prophets and its acolytes are chiefly to be found in politics, in business/economics, and in science. It is within these three spheres, and particularly in their co-operation, that the DWEP is most clearly exposed. It is for this reason, the disproportionate concentration of power in the hands of men in suits, that the role of economic assumptions plays a large role in this dissertation. As a cultural paradigm the DWEP draws support from the institutional paradigms of science, of economics and business, and of philosophy. Yet it will be argued that it is the combination of these institutional paradigms in to a cultural one, and the working through of the assumptions inherent in all the field, which is so damaging to people and their environment.

Human-nature relations

The overriding characteristic of human-nature relations within the DWEP is the distinction made between human and their environment. The "environment" has become a synonym for nature, and is taken to be "everything beyond our skins" (Burk, 1980, p. 47), reinforcing the failure to appreciate that people actually form a part of Nature. The very use of the word "environment" is problematic, coming as it does from the transitive verb "environ" - "to surround, hostilely or protectively". "Environment" is defined as "surrounding objects or conditions" (Oxford English Dictionary). In other words the use of the word places humans at the centre of the discussion. The very word exists on the implicit assumption that nature exists apart from people, and its use perpetuates that assumption, albeit not explicitly. For this reason environmentalism is not regarded here as necessarily being Green, although others do not make the distinction along the same lines (O'Riordan, 1981), a point which will be expanded on in chapter three. Indeed, it is suggested here that environmental science, certainly in the South African instance, is more of an attempt to remove the social and political context from geography than it is an attempt to introduce environmental concerns to science, something which it might be argued is behind the generous sponsorship of the oil industry for chairs of environmental science in South Africa[4]. It seems that geography is too socially aware to enjoy the support or understanding of science faculties, or of big business.

It is easy enough to model the changing human perceptions of their place in the scheme of things. One of the more enduring models, lasting almost from Plato to Pope, was the "Great Chain of Being", a hierarchy ranging from God at the apex, down through angels, men, women, beasts, birds, fish, and insects, beyond the range of human detectability (Lovejoy, 1942). Western science and philosophy removed God from the model, effectively truncating the chain. Man was now paramount. Following the scientific wisdom of the period, a circular rotation of this truncated ladder created the familiar atomic model, a universe with Man (used here deliberately) at the centre, and everything else circling him in increasingly distant and irrelevant orbits. Man is distinct from, and at the centre of, everything else.

This anthropocentric, or even androcentric, perception is reinforced both overtly, for example by ecology being taught as a part of zoology and botany, thus deliberately ignoring the social component; and covertly, such as the distinction between human and physical geography. The net result of the strength of this perspective has been a distorted concept of interaction with nature. Nature has become

4 Shell sponsor the Shell Professor at UCT (where the building itself is also called Shell, in spite of staff and student protests) and BP have a chair at Pietermaritzburg.

something to be managed, and is reduced to little more than a mathematical problem for planners and accountants.

By the same logic, environmentalism is reduced to a means of reducing impacts on nature, or attempting to patch up problems that have arisen, an approach Naess (1973) labelled `shallow', or `reform' ecology. Reform ecology uses terms such as `conservation of natural resources', and `wildlife management', which reveal an underlying anthropocentrism and alienation from nature. The use of the word "environment" fits in to this pattern, being a more scientific and less mystical sounding term than `Nature'. It will be argued that `environmentalism' is an attempt to deal with the `environmental crisis' from within the DWEP, and as such is doomed to failure. In contrast Naess' Deep Ecology sees humans as an integral part of the complex network of relationships that is the universe, and rejects this alienation and anthropocentrism. Deep Ecology is an attempt to challenge the assumptions of the DWEP, and can thus be considered to fall within the Green Paradigm. This is not to say that for all individuals who seek to operate within the framework provided by the Green Paradigm, it would be considered reactionary to clean up an oil spill, but that for some theorists a concentration on reform type issues is an avoidance of the underlying problem (Devall, 1980, 1988). Such a concentration serves to persuade people that the environment requires management, and that it can be, or is indeed already being controlled adequately. Conservation and preservation are not concern for nature; they are terms used to describe the status of resources.

The attitude to pollution is similar. It is reduced to economic terms such as `negative externalities' and `spillovers', and attempts are made to put financial value on fresh air and drinkable water. Proposals have even been made for the sale of `pollution rights' (Dales, 1968; Yandle and Barnett, 1974; *Time*, 12 February 1990) in terms of which the state might be deemed the owner of a river, for example, and would sell to companies the rights to pollute the water to a certain degree. The number of rights sold would not be based on the costs of cleaning the river, but on whether the level of pollution was `satisfactory'.

A further alienation of people from nature, the "estrangement between person and institution - between person and world" is noteworthy (Jones, 1987, p. 22). Nature becomes something to be left to the experts. Within advanced industrial society only institutions can hope to manage the complexities of `the environment'; such complexities are beyond the abilities of individuals, and particularly beyond the abilities of lay people. The emergence of the industrialization, based on continually increasing production and consumption, has meant that the institutions of industrial society are geared toward the promotion of material growth and progress. Efficient and rational management has become the goal of the institutions; means have become ends. Not only are the individuals estranged from the institutions, the institutions are estranged from Nature.

The Roots of the Dominant Western Environmental Paradigm

The all-pervasive nature of a cultural paradigm makes an investigation of its roots particularly difficult. In 1967 White laid the blame at the door of religion, the book of Genesis in particular. The main argument was that the Bible encouraged a perception of the Earth as existing simply for the use of humankind. The paper caused a lot of soul-searching in theological quarters, and stimulated a number of papers and books (e.g. Passmore, 1974; Santmire, 1981; Joranson and Butigan, 1984) which used biblical evidence to prove the opposite. The debate did, however, suggest that religion may be interpreted within, and can reinforce, any paradigm. Also in 1967 the geographer Glacken published his enormous contribution, *Traces on the Rhodian Shore*. In this work he examined many of the same arguments as White's and traced their pagan roots to ancient Greek and Roman cultures. The vast number of strands of thought that go toward the creation of a cosmological world view become apparent as does the time scale of such a creation; a `religious' idea at some point, a `scientific confirmation' several centuries later, and the pattern is slowly and inexorably woven.

Any discussion on the roots of a cosmology, or of a paradigm that exists within one, must necessarily examine the various categories of thought that contribute to the ultimate pattern. It is seldom that only one strand can be said to have created the whole; indeed it is not only the different strands but their interrelationships that are important. Like a tapestry, the whole is more than the sum of its parts.

White (1967) was correct. There are some biblical justifications for perceiving nature as a commodity. That there may be other perspectives will not become relevant until there exists a framework within which they can be articulated, although they themselves contribute to the creation of such a framework.

Science supported the human-environment distinction. Darwin's survival of the fittest, Newton's irreducible atom, and Linneaus' taxonomic categorization all provided the authoritative voice of science. The predictive power and universal applicability of the Newtonian model led to its virtual institutionalization in Western science, and its being embraced as a working picture of Nature, by effectively all European intellectuals. Nature became a machine.

The roots of Linneaus' taxonomy are also Greek. It was Aristotle who proposed the classification of organisms according to species, genus, family, order, class, phylum, and kingdom. He recognized that the hierarchy was artificial, but it created a view of nature that disregarded the ecological connections between organisms (Callicott, 1982). It resulted in a `shopping-list' perception of nature, in which living organisms or whole species could be added or subtracted with impunity, cloaked in the mantle of scientific empiricism.

Western philosophy has tended to reinforce the separation time and again. Descartes separated mind (confined to humans) from matter. Similarly, the English Empiricists, notably Hume, assumed that inferred knowledge proceeds outwards from the self, and from experience to general inferences (Partridge, 1981). The influence of Hume was also crucial in providing direction for science. It was his Naturalistic Fallacy, the illegitimacy of an attempt to logically derive an `ought' from an `is', which contributed significantly to the perception of science as value free. Fear of committing this Naturalistic Fallacy prevented scientists from producing normative hypotheses. It is, however, argued that the attempt to produce norms which are justified by reference to facts about ourselves and the world, as this dissertation attempts, is more than an attempt to produce a normative proposition from a factual proposition. Instead the aim is to show that another logical relationship, that of epistemic implication, justifies the passage from factual evidence to prescriptive and normative conclusions (Lee, 1989). It is not only justifiable, it is desireable, for geography to suggest appropriate relationships with the non-human world. Similarly it is not justifiable for geography, or science in general, to propose or support relationships which evidence suggests are harmful. While there is nothing unusual about civilizations rising and declining as they expand beyond their resource base, our present society is, as far as we know, the first one to have the power to use the entire planet as its resource base. Overstressing the resource base thus implies overstressing the entire planetary system, and logic suggests that it should be avoided.

The logical atomists of the early twentieth century refined Hume's theory, suggesting the structure of knowledge reflected the structure of the world, a collection of discrete atomic facts joined only by external relations among them. From the logical atomists arose the logical positivists, who propounded an ethical system contending that meaningful discourse was mathematical, not moral.

Although few would today confess to being logical positivists, it is a school of thought that remains common. The school contains an explicit anthropocentrism, as well as an implicit eurocentrism, which distrusts of any mode of thought based on traditional, pre-, non-, or anti-industrial values.

As a result of the dominant scientific/philosophical position, nature was perceived as being without intrinsic worth. Its value then necessarily became purely extrinsic; simply financial. Nature had value as a commodity, or as a collection of resources for human exploitation. Since economic theory is about allocation of resources, it was only reasonable that it would be applied to nature. Yet if economics may be capable of putting a price on a commodity, it does so within the value system that exists in society. It is beyond the scope of economic theory to create value systems. For example welfare economics, which examines value systems in economic reasoning, places the onus of value judgments on the individual rather than the economist. It perceives the welfare of society to be maximized when that of each individual, as judged by the individual, is maximized. This means that in a system where welfare is judged financially, changes in the economy designed to improve the general well-being of people are only sanctioned if it can be demonstrated that the financial gains will outweigh the costs. Making air or water pure is not regarded as a valid justification for pollution control. In addition, by accepting the values of the system, welfare economics becomes committed to that system. The acceptance that the individual is sovereign over all values, economic or other, is inherently positivistic, assigning people a primary place in the universe where they are free to substitute one element of the environment for another to increase their own satisfaction (Burk, 1980).

The psycho-sexual is a further root of the DWEP which must be considered. While noting the pitfalls of reductive analysis, it must be accepted that there is validity in the claim by feminists and others that Western science and philosophy have been almost exclusively male pursuits since their inception. It would be naive to assume that gender-based male characteristics like aggression, rationality, and domination have not been subsumed into the ruling paradigm (Salleh, 1984; Hallen, 1987). It is important to distinguish for the purpose of this argument between sex and gender. Sex is biological, but gender refers to the roles which society has created around sex. As such it has become a fundamental category for organizing human relations (Hallen, 1987). The domination of women by men has been accompanied by the promotion of `masculine' virtues (self-assertion, rationality, power seeking) at the expense of `feminine' ones (nurturing, caring, emotionality, receptivity). Science has assumed a leadership role in society. The majority of scientists are male and have brought to science virile, domineering, and exploitative characteristics. Men have created what feminists have called the "hegemony of science" (Keller, 1985). It is further argued that this has created an imbalance within science, one which will not be redressed until science is reclaimed as a human, not a masculine, project (Hallen, 1987).

Anomalies in the Dominant Western Environmental Paradigm

Scientific anomalies

It has been suggested that it was Bacon who extended the masculine-feminine distinction into the scientific method (Merchant, 1980; Hallen, 1987; Jones, 1987). For Bacon science was no longer contemplation of reality; it was a struggle for power and mastery. Knowledge was not regarded as an end, but as a means for the technological conquest of nature by man. It was regarded as necessary for men to have control over nature in order to further their own goals. Furthermore it was assumed that nature was not going to give up her secrets willingly. Knowledge had to be wrestled from nature's grasp through confrontation and conflict. Small parts were to be analyzed so that the scientist could uncover causal connections between them within the framework of universally applicable laws and theories. The approach thus gives priority to the parts over the whole, under the presumption that knowledge of the whole can gradually emerge from an understanding of the causal relationship between the parts (Jones, 1987).

If it was Descartes, Hume, and Bacon who laid the foundations for the philosophy of science, it was Newton who put into practice the mechanistic worldview of a consistent, mathematical theory as the foundation for scientific thought. It is this Newtonian worldview which has persisted long after other work in physics (notably that of Einstein's relativity, and more especially the work of Rutherford and others at the beginning of the twentieth century), which revealed that atoms were mostly space, and consisted of smaller forms themselves. It is the content of these forms which poses the problem for the Newtonian model. Although there are about eight interpretations of quantum physics, even the Minimal Copenhagen interpretation suggests that quantum theory has significant implications for the subject-object dualism of classical physics (Bohm, 1980; Callicott, 1985; Jones, 1987, Zimmerman, 1988) in that there may not be a precisely knowable reality existing outside the observer. Indeed the vocabulary of classical physics is not adequate to describe sub-atomic reality. It is not unreasonable to assume that, under a dominant paradigm which is predicated upon a subject-object dichotomy, interpretation of quantum theory has been somewhat constrained. It may have been this which led many of the pioneer physicists to mysticism in an attempt to transcend the restrictive paradigm (Wilber, 1985). Schroedinger, (cited in Keller, 1985, p. 14) in fact pointed out that science rests on two fundamental tenets - its axioms - in its relations with nature. It must assume that nature is objectifiable, and that it is knowable. Reality has a nasty tendency to mock both these assumptions.

Even evolutionary theory, which is so fundamental to the DWEP, is in crisis. Scientists are rejecting the fundamental tenet of Neo-Darwinism, the assumption that the natural selection of random variants is both necessary and sufficient to explain all evolution. In the past evolutionists were simply expected to accept this synthetic theory as given, and to concentrate on showing how the process would have operated under different circumstances. Acceptance of this theory had a profound influence on how the organisms themselves were studied; contributing to the whole picture of science physically wresting nature's secrets from her. More importantly, it contributed to the tendency to regard organisms, and even societies, as decomposable into distinct traits, every one of which must necessarily be assumed to confer some selective advantage in the struggle for life (Ho and Saunders, 1984). This theory is being attacked from all sides. Some are pointing out that the only reason it continues to be reconfirmed is that it is structured so as to be unfalsifiable, and any observation can be made to appear consistent with the theory. Others point to gaps in the fossil record, or the problems of mechanisms of non-Mendelian inheritance. Instead scientists argue for a pluralism in approach to evolutionary studies. Organisms and societies are studied as integral wholes, rather than as collections of traits. From this starting point attempts are made to understand how they evolved; a reversal of the old approach which started with a fixed model of evolution, and then fitted observations in to this framework (Ho and Saunders, 1984). Similarly the study of recombinant DNA techniques in biology have challenged the reductionism of Dawkins' (1976) "selfish gene" (Ho and Fox, 1988). This discussion will continue in chapters three and four.

Just as quantum physics has the potential to undermine the subject-object dichotomy, so too has ecology. Ecosystems, for example, must be studied as wholes. Studying the life of a single ant is not going to reveal much about the structure of a colony. The causal link between refrigerator coolant and global warming may be apparent once the evidence has been collected, but it indicates that the ramifications of actions may be entirely beyond the ability of science to predict; an insight supported by recent work in chaos theory. Indeed NASA's satellites had for many years been collecting information which revealed drastic ozone depletion, but the data had been rejected by the computers as spurious simply because they did not conform to what was expected. Accumulating evidence suggests that the Earth (and perhaps beyond) is a system, or a part of a system. Any action could conceivably have repercussions that may be entirely unexpected. It must be remembered that in its present format science is limited by the imagination of its practitioners. If a connection cannot be imagined, it is unlikely to be explored, unless and until it makes itself apparent. What this means is that there is a potentially infinite number of unexpected results of any action. A science that insists on extracting items from their web of relations in order to study them is thus fundamentally ignoring the connections, which should be the object of study. This point is expanded on in chapter four.

Philosophical anomalies

Close examination of the roots of the DWEP tends to highlight its shortcomings. This suggests that the roots are not abstract or complex, but are hidden within convoluted thinking and obfuscation which disguises their simplicity. That they are scattered throughout science, philosophy, and religion also makes them less readily accessible.

Central to the inadequacy of the DWEP is, as has been noted, the human-nature distinction and its associated problem of value. Indeed normal Western ethics provide only an instrumental, not an intrinsic, perception of non-human natural entities and of nature (Callicott, 1985). It would seem that an axiological system - the bedrock beliefs - of a truly natural ethic would grant nature an intrinsic value, following Callicott's (1985) interpretation of intrinsic value (as opposed to inherent and extrinsic) as being a value that exists independent of any valuing consciousness. The difficulty is that classical naturalistic axiologies tend to base inherent value, often only granted to humans, in properties such as reason, or moral autonomy. Even the more liberal theories associate intrinsic value with consciousness, organization, the will to live, or some such criterion. Limiting the criteria is an entirely arbitrary act. The problem is not with the axiological goal, but with the theoretical approach itself. The axiological base of the DWEP is thus incapable of accommodating a valuation system without resort to some arbitrary classification. At present the system grants intrinsic value only to humans, based as it is on the subject-object dichotomy and perception of human superiority. In light of the insights of the Green Paradigm, such arbitrary classification is unjustifiable and illogical.

Economic anomalies

It is on this flawed philosophical/scientific foundation that economic theory has arisen, entrenching the existing limitations and adding yet more. Theoretical free marketeers remain of the opinion that externalities are unimportant, and that the system will be further improved by giving the market an even freer hand (Costanza and Daly, 1987). A truly free market is an impossibility, however, and existing systems of national accounts fulfill few of the criteria for a free market. The multiple manifestations of the planet's environmental crisis emphasize the point that economics operates in a social context, where the goals and values are determined by and for people. Given the anthropocentrism of the context, the question must be asked whether a free market really is free as far as the rest of the entities on the planet are concerned. Moreover, even if it be free for people (possible only in theory) if people are only a part of a system, is it appropriate to value a whole system from the narrow perspective of one part of that system? It is argued that the emergence of capitalism is a continuation of the process of actualizing the assumptions of the DWEP, and that capitalism and conventional economics cannot be fully understood without an examination of the DWEP, a point expanded on in the third chapter.

This difficulty of applying anthropocentric value systems to nature is more easily appreciated from a sociological perspective, using the notion of a societal-environmental dialectic (Schnaiberg 1975, 1980, 1983). The dialectic was developed as an explanation of the three key forces of advanced industrial society. These are:

Economic expansion of societies necessarily requires increased environmental extraction;
increased levels of environmental extraction inevitably lead to environmental problems;
these ecological problems pose potential restrictions on further economic expansion (Schnaiberg, 1975).

If the thesis of the societal-environmental dialectic is "economic growth is a social desideratum", then the antithesis is "ecological disruption is a necessary consequence of economic growth" (Schnaiberg, 1975, 6). There are three proposed syntheses: economic, planned scarcity, and ecological. The economic, it is argued, has been "the dominant historical model for virtually all industrial and industrializing countries" (Schnaiberg, 1975, 7), and simply ignores the antithesis of ecological disruption. The ecological problems which then arise lead to the second synthesis of planned scarcity. In this synthesis the state, economy, science, and technology attempt to regulate society so as to address some of the more pressing ecological problems. The underlying feature of this synthesis is the focus on only the most severe problems, particularly those which threaten production or health. The third synthesis, the ecological, is hypothetical, because there are no examples within industrialized society. In this synthesis economic activity would be curtailed, and major efforts would be made to address the ecological problems through controls on production and consumption. Others note the strong pressure to maintain the economic synthesis, and note how the managed scarcity synthesis of the 1970s in the USA gave way to an economic synthesis under the Reagan administration (Buttel and Humphrey, 1987). The reason lies in the function of the state in the DWEP, which is to create the conditions for profitable capital accumulation, and to foster social peace as legitimization of the state. These imperatives may be seen to be mutually contradictory (O'Connor, 1973). It has been suggested that to create the conditions for capital accumulation, the state must support profitable, capital-intensive production techniques over less profitable, labour intensive ones. It is also argued that the state requires economic growth so as to ensure increased tax revenue in order to avoid fiscal crisis, and that in the short term the cheapest way for the state to ensure social peace is through an increase in economic activity and employment. For this point of view then, the state response to the socio-economic problems of capital intensive production will be policies which lead to further expansion, steps that have been called the "treadmill of production" (Schnaiberg, 1980):

> "As the treadmill of production proceeds, environmental disruption will intensify, leading periodically and temporarily to a planned scarcity synthesis, but with compelling political-economic pressures to return to the economic synthesis within which the treadmill is again intensified" (Buttel and Humphrey, 1987, p. 49).

Within the Dominant Western Environmental Paradigm, assuming industrialism to be the development style, the position of nature becomes more apparent. In order for the society to exist, it becomes necessary for nature to occupy a subordinate role, and there is an imperative that environmental exploitation be permitted and indeed encouraged.

The implications of the DWEP

It is the implications of the DWEP which most concern geography and geographers. Nature is placed in a subordinate position to humans. Nearness to nature is seen as inferiority. Independence from nature is superiority; thus power over nature is superiority, and thus power itself is regarded as an indication of superiority.

Lack of power is inferiority. Inferiority implies a closeness to nature, closeness to nature implies status as a resource for the powerful, but more it implies a lack of accountability on the part of the powerful. This is obviously something of an oversimplification, and the point will have to be expanded on later. For the moment, consider the relationship between science, economics, and politics. Consider the relationship between the First World and the Third. Consider nuclear waste, acid pollution, and the thousand other manifestations of the environmental crisis, and finally consider how they are all linked.

What this subordinate position of nature means in material terms is that rain-forest destruction, for example, will continue, because those countries responsible for the destruction have balance of payments problems to address, and balance of payments problems are within the conventional field of economics while rain-forests are not, unless they are added artificially. Such an addition has the ring of a `planned scarcity' synthesis about it. It fails to address the economic system which subordinates nature, and instead concentrates on ameliorating one discrete, yet publicly visible and emotive, aspect of the problems that arise from this subordination. A changing interpretation of the human-nature relationship is thus of profound significance, having the potential to completely alter the structure of society. One of the key assumptions of Schnaiberg's synthesis is the social need for economic growth; the reasons for this perceived need must be examined more fully; a debate which occurs in chapter three.

Identifying the Green Paradigm

One of the earliest examples of the word *Green*, used in the holophrasic sense to mean all that we do today, is to be found in Andrew Marvell's poem, *The Garden*, written in about 1650. This poem alludes to the futility of a rat race which achieves no more than the artificial separation of people from nature. Far wiser, suggests the poet, to attempt to appreciate things as they are. How futile and arrogant to sacrifice the whole for the sake of a part.

How vainly men themselves amaze
To win the palm, the oak, the bays,
And their incessant labour see
Crowned from some single herb or tree
Who's short and narrow verged shade
Does prudently their toils upbraid,
While all flow'rs and all trees do close
To weave the garlands of repose.

...

Meanwhile the mind, from pleasures less,
Withdraws into its happiness:
The mind, that ocean where each kind
Does straight its own resemblance find,
Yet it creates, transcending these,
Far other worlds, and other seas,
Annihilating all that's made,
To a green thought in a green shade.

For Marvell, *green* here is a metaphor of infinite imaginative fertility. Green, as the colour of spring, has always been a colour symbolizing rebirth and life. It is suggested here that Green thinking is actually a different cultural paradigm; it is a changing of the perceptions that govern human-nature interactions. This change is of great significance to geography, a discipline better placed than any other to study these relationships.

It is possible to extract from the burgeoning Green literature, and from older texts, such as Lovejoy's (1942) *The Great Chain of Being*, and Glacken's (1967) *Traces on the Rhodian Shore*, as well as from Plato and Aristotle, the key elements that distinguish the Green Paradigm from the DWEP. Just as Copernicus overturned the Ptolomaic paradigm by pointing out that the universe is not centred around the Earth, so the Green Paradigm points out that it is not centred around people either. This is the essence of the Green Paradigm; it is a cultural paradigm based on the assumption that people are a part of nature. This may look like a fatuous statement, but it is only when one begins to examine the structures of our society, including science, that one begins to realise the implications of the perception.

There is a certain irony in this; for the most part science has been directed at attempting to control nature for human use, and yet again and again it has produced evidence that people are an integral part of Nature, they are not above it. Nature is a complex system in which humans have a role to play, but Green thinking points out that the system is not there for the sole benefit of *homo sapiens*. It makes no sense for one part of a whole to exploit another to the ultimate detriment of the greater whole. The Green Paradigm frames human society as an ecosystem. It is not *like* an ecosystem, it *is* one; a complex network of relationships between humans and their environment. It is composed of smaller systems, and in turn forms a part of larger ones. As such it is subject to similar limitations and natural laws as other ecosystems, similar goals and development processes (Knill, 1991a, b).

There is no single theoretical approach which can be declared to be an example of all the Green Paradigm really means. There are various theories, most notably Social Ecology, Deep Ecology, Eco-feminism, and the Gaia hypothesis, which articulate certain aspects of the Green Paradigm, often under the guise of being paradigms (or even *the* paradigm) themselves. Usefully, if accidentally, each of these has tended to answer one of the anomalies of the Dominant Western Environmental Paradigm. Attempts to unify the approaches have not yet succeeded, and there are some quite significant differences of opinion. The Green Paradigm is sufficiently different an approach to challenge the DWEP's perception of human mastery. In its minimal interpretation the Green Paradigm recognizes that people are simply one part of a complex system. They are dependent on that system, not the inverse, and there is neither justification nor logic in exploiting the system for human benefit to the detriment of that system.

If the Middle Ages had its Great Chain of Being, and the DWEP has its `atomic reality', then the Green Paradigm too has its metaphor. In the earlier parts of this century James Jeans (in Capra, 1982, p. 76) suggested: "Today there is a wide measure of agreement...that the stream of knowledge is heading toward a non-mechanical reality; the universe begins to look more like a great thought than a great machine". Similarly, Heisenberg (in Capra, 1982, p. 70) said: "The world thus appears as a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and thereby determine the texture of the whole". This discussion is continued in greater depth in chapter four.

As early as 1926 Smuts published *Holism and Evolution*, examining the social impacts of this new scientific perception. It is therefore hardly surprising that there should be a several interpretations of the rising paradigm. More surprisingly, they are all products of the last 20 years, even though the gist of the idea can reliably be traced back as far as Plato. These interpretations are presented in this dissertation as examples of thought systems which have been deliberately and self-conciously constructed around the axiomatic assumption that people are an integrap part of Nature. Supporters of these schools often claim that these theories are paradigms in themselves. They are not, at least not at the scale of a cultural paradigm. Nevertheless they do indicate what may be expected from a society which is based on the axioms of the Green Paradigm, and as such they provide an indication of the role of science within such a social system.

Social Ecology

Social Ecology sees itself as revolutionary, not merely radical, and specifically claims for itself an holistic perception (Bookchin, 1988). Although soundly rooted in neo-Marxist analysis, it criticizes the evolution of all forms of hierarchy, and claims a humanistic moral approach, stressing the importance of the human component. With its roots in Hegel's dialectic, it opposes any centricity, bio- or anthropo-, or at least claims to. The failure of the existing left wing to completely internalize `environmental' issues indicates that there are problems with its implementation. In essence Social Ecology asks the question `is it really feasible to improve human-nature interactions without first improving inter-human interactions?'

Deep Ecology

Whereas Social Ecology criticizes Deep Ecology for ignoring the social component, Deep Ecology questions whether Social has really progressed beyond a disguised anthropocentrism. Deep Ecology grants a value to wilderness, and stresses notions such as sense of place, opposition to industrial society, an opposition to stewardship and other anthropocentrisms, and an ethos of spirituality and Self-realization (Sale, 1988) through an ecologically centred philosophy; an Ecosophy, in Naess's terminology. In the language of Deep Ecology (lately also called Transpersonal Ecology (Fox, 1990)) the Self is identified through its environment, rather than by abstracting it from its environment [this being the difference between Self and self] (Fox, 1990). This is a particularly useful distinction, since it goes a long way towards appreciating the importance of sense of place, and of the emotional reaction of people towards a perceived threat to their place.

Eco-feminism

Countering Deep Ecology, Eco-feminists raise the criticism that the issue at stake is not anthropocentrism, but androcentrism - male-centredness, and Deep Ecology may simply be entrenching this. Eco-feminists suggest that masculine characteristics such as domination and aggression may have been appropriate in conquering the world, but the world is now well and truly conquered, and a new model for interaction with nature has become necessary. Granting increased status to feminine characteristics such as empathy, nurturing, and caring may help improve the balance.

Gaia

The Gaia hypothesis has the potential to provide a scientific approach to the study of the world as a system, or perhaps as a part of a system. It differs from other approaches in that it arose in the realms of natural science, with no social component at all. In spite of this, the hypothesis provides a sound argument for seeing the Earth as a self-regulating system, with humans as just one component of that system. An important component certainly, but not the centre of the system.

Some of the differences between the four schools of thought are more serious than others. Both Social and Deep Ecology attempt to include the Eco-feminist critique (Bookchin, 1988; Fox, 1989b; Naess, 1989 pers. comm.) and can do so to a certain degree without any internal problems for their theoretical bases. The Social-Deep dispute is more fundamental, although it may be ameliorated if Deep Ecology were to find a way to deal with the social nature of `environmental' problems without compromising its non-anthropocentrism, or if Social were to acknowledge that it does posses a degree of anthropocentrism in its critique. Indeed there are both positive and negative aspects to anthropocentrism - humanity after all has some valuable contributions to make - and this should be the focus of some work and some compromise. Perhaps the most important and dangerous aspect of the dispute is the confusion between the critiques and ideals of not only `opposing' schools, but of their own too. Each school has a critique of the existing paradigm, shaped by its own background. Similarly each has an ideal of the future. They necessarily differ, but their roots are intertwined below the surface. Ultimately they may complement more than they conflict. This debate continues in chapter five.

Conclusion

The Dominant Western Environmental Paradigm is presently suffering a crisis. Fields which have been granted high status within the DWEP are discovering anomalies which cut at the very foundations of the paradigm. Attempts to deal with these anomalies have led to a critique of the paradigm itself. The anomalies have existed for a long time, and have been noted regularly in the past, but have never had sufficient impact to counter the DWEP. As a cultural paradigm based in power and exploitation it has always been possible for the DWEP to crush criticism. Crushing criticism has not removed the anomalies, however, and the multiple facets of the `environmental crisis' now hang albatross-like about the neck of the DWEP. There is no reason to believe that they are going to go away this time.

Although the Green Paradigm is a poorly developed alternative at present, it is argued that it possesses the potential to accommodate some, if not all, of the anomalies. It holds a perception of reality which would be more readily acceptable to thinkers in science, philosophy, and even religion, than that of the DWEP.

There is no single, particularly satisfactory school of thought to carry forward the Green Paradigm. Given the multi-faceted nature of paradigms this would be well nigh impossible. Instead it is being admirably taken forward by the four schools mentioned, as well as many others which are less easily identifiable. There is certainly a danger of in-fighting between supporters of the schools, and they would do well to remember the size of the vested interests within the DWEP. Nevertheless, there is a dialectical progress to be obtained from argument, and the cross-pollination of ideas is healthy. There remains a fundamental agreement among the supporters of all these schools that the real cause of the `environmental crisis' is the inappropriate human-nature relationship. Only a fundamental alteration in this relationship will produce a permanent solution to the problems. It is suggested that the framework provided by the Green Paradigm can support progress towards this new relationship, and that a reassessment of the human-nature interface must have significant implications for science, particularly geography. Although the change would be radical, it would not be impossible for geography to adopt the framework of the Green Paradigm, and thus become a truly integrative and holistic discipline. More than this, however, it is argued that without the deliberate construction of a disciplinary paradigm in sympathy with the Green Paradigm, geography will be unable to perform its function of dealing with difficulties in the interface between people and the rest of nature.

Chapter 2
The Roots of the Dominant Western Environmental Paradigm

Introduction

This chapter examines in some detail three of the main roots of the Dominant Western Environmental Paradigm, and considers what their implications have been for the DWEP. Quite obviously it is impossible to cover all the contributing strands of thought here; a great deal of work has already been done in this regard, and it takes several books (e.g. Thomas, 1956; Glacken, 1967; O'Riordan, 1976, 1981; Pepper, 1984). It is to be hoped, however, that enough detail of the main ideas may be presented for the implications to become apparent. What should also become apparent is the extent to which these roots are interconnected and mutually supporting, necessitating a simultaneous investigation both of all of them, and of their interrelationships

What is being examined in this dissertation is a cultural paradigm, and it is therefore necessary to investigate numerous fields in order to find ideas which reinforce one another and thus build up the whole. It is interesting to note that this may lead to a situation where the paradigm exists simply because it is justified on so many levels, each of which uses others to justify its own interpretations; a tautologous existence if you will.

An example of this would be a conventional economic[1] approach to nature, based as it is on the assumption that nature exists solely to be used by people. There are obviously problems with this approach. However it is predicated upon a particular philosophical justification, which in turn supports and is supported by a particular

1 Conventional economics is used here to refer to both classical economics and the myriad of versions which have post-dated it such as Keynesian, neo-classical, and monetarism; economic theories which are effectively in operation at present.

religious interpretation (which also supports the economic), all of these may be underpined by a particular psycho-sexual analysis, and all of these hinge on the idea of mastery over nature. Any one (or all) of these institutional paradigms may contain arguments to counter the dominant cultural paradigm, but because of the diffuse structure of paradigmatic support these may be played down in the face of corroborating `evidence' from the other areas. Alteratively they may be assimilated, colonized, or disparaged. What this really means is that a paradigm can just as easily be based on vulgarized theories, imaginary evidence, half truths, and complete lies, as it can on reality. It has the potential to be a lie that exists only by common consent. Nevertheless it provides a framework through which workers in all of those fields which lent it support, as well as in others, can view their role in the world.

It may then be asked whether it is legitimate to abstract from the vast milieu of time a number of ideas, and to claim them to be indicative of a particular train of thought, in this case that people are superior to nature. Given that history, like religion, is open to interpretation, and also given that no one quote or piece of information can be claimed as representative of an attitude, let alone an era, is it correct to adopt such an approach? It is contended here that such an approach is valid and indeed vital. By its very structure, a cultural paradigm consists in a number of corroborating ideas linked around a central theme. It is seldom necessary to consult obscure texts in order to find the roots of a paradigm; they are generally well referenced by the supporters of that paradigm, as a part of their own process of legitimation of the paradigm. Consultation of arcane ramblings might be of doubtful value in the quest for the roots, but the collection of major ideas and approaches from well recognized sources and well documented history is not only legitimate, it is essential.

Judeo-Christian Theological Support for the Dominant Western Environmental Paradigm

Paradigms are a mental construct, and it must be borne in mind that evidence of religious support for the DWEP does not imply that a particular religious system wholeheartedly supports a particular cultural paradigm. Rather it is that supporters of the paradigm, their worldview shaped by it, tend to interpret religion (among other things) so as to support their perception.

> Christian thought, like any other which brings into focus numerous ideas from many sources,...is not a unified body of thought; it is more like a series of texts which have accumulated numerous exegeses which comment not only on the text, but on other exegeses as well (Glacken, 1967, p. 150).

It is these exegeses which shape and are shaped by the paradigm dominant at any given time. In fact Biblical evidence can be used to support both the DWEP and the Green one (Glacken, 1967; Pepper, 1984).

The paradigmatic interconnection of ideas from different fields is evident in the differing approaches of Latin and Greek Christianity. Where Greeks felt sin was intellectual blindness and believed that salvation lay in clear thinking; Latins felt sin was a moral evil and believed that salvation lay in right conduct. The Greek, or Eastern, orthodoxy was intellectual; the Western was active (White, 1967). It was the active aspect that was siezed upon and which has come to form a major part of the ethos of `progress', at the expense of the intellectual approach. It would appear that within the other constraints of the Dominant Western Environmental Paradigm, the idea of activity was more acceptable than the idea of intellectualization.

The Old Testament, the book of Genesis in particular, is frequently cited as containing suggestions that the Earth exists for the benefit of humans (e.g. White, 1967). In the first chapter of Genesis[2]:

> "God said `Let us make man in our image and likeness to rule the fish in the sea, the birds of heaven, the cattle, all wild animals on earth, and all reptiles that crawl upon the earth.' So God created man in his own image; in the image of God he created him; male and female he created them. God blessed them and said to them, `Be fruitful and increase, fill the Earth and subdue it, rule over the fish in the sea, the birds of heaven, and every living thing that moves upon the earth.' God also said, `I shall give you all plants that bear seed everywhere on earth, and every tree bearing fruit which yields seed: they shall be yours for food" (*The New English Bible,* Gen 1:26-30).

A great deal hinges on the creation concept; it was one of the major factors which led to the implicit faith in the idea of perpetual progress as being the lot of humans. Western society is today built very squarely upon this notion - progress is simply seen as inevitable, and it is always equated with growth. This is a notion unknown either to Greco-Roman antiquity, or to the Orient. It is rooted in and indefensible apart from Judeo-Christian teleology (White, 1967). The ethic of perpetual progress is to be found in other thought systems such as Marxism and Islam, but in this context it merely confirms that they have their roots in the Christian axiom (Glacken, 1967).

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2 All Biblical quotations are from the same version of *The New English Bible*, although a comparison of versions and translations made under different historical circumstances and different ruling paradigms could be expected to support the idea that religion is interpreted in the interests of the ruling paradigm.

Roots of the DWEP

Unlike many of the world's mythical systems, the Greco-Roman possessed a poorly developed notion of the creation. Many of the ancient West's intellectuals denied that there had been a beginning, subscribing instead to a notion of cyclical time (White, 1967). Christianity brought with it from Judaism a notion of time as non-repetitive, as well as a dramatic story of the creation. As has been noted, however, the description is so brief that additional explanation was inevitably demanded, giving rise to a vast exegetical literature (Glacken, 1967). This has continued from the beginning of the Christian Era to the present, and to a degree provided the foundation for much of science. Science in its early days was an attempt to understand how the creation operated. Indeed, from the thirteenth century on, up to and including Newton, every major scientist more or less explained his motivations in terms of religion. Newton, for example, seems to have regarded himself more as a theologian than a scientist. Only in the late eighteenth century did God become an unnecessary hypothesis for many scientists (White, 1967).

Within the creation of Genesis, God created light and dark, the heavens, and the Earth with all its plants and animals. Into this God placed Man[3], who named all the animals, thus establishing dominance over them. The whole world was planned for the benefit and rule of man; and though man was made of clay, it was in the image of God. In contrast to the pagan religions and almost all those of Asia, Genesis not only established a dualism of people and nature, but insisted it to be God's will that humans exploit nature for their own ends (White, 1967).

This new religion made nature accessible and vulnerable to exploitation. Christianity undermined the ancient tradition of pagan animism. In this every hill, every tree, every spring and forest, ocean and mountain, had its own guardian spirit or *genius loci*. While they were accessible to humans, these spirits were very unlike them; they were fauns, centaurs, unicorns, and so on, or else they were simply invisible and without form. Before one could exploit nature, dam a river, mine a hill, fell a tree, it was necessary to placate that spirit and to keep it placated. With the absence of the spirits, it was possible for Christians to exploit nature indifferent to the feelings of the objects of exploitation. The previous inhibitions were effectively removed (White, 1967). Similarly the geocosmic interpretation of Mother Earth as alive and sentient provided some normative constraints against mining or other forms of violation of the planetary body, frequently likening such actions to rape (Merchant, 1982). Christianity and science aligned to refute this perception, seeing the planet as a storehouse of treasures for human use. This is in no small way the reason why Judeo-Christianity was so successful; by allowing greater exploitation it entrenched its own power. Not only

3 The discussion deliberately retains the original language use here because it is seen as significant.

was it able to justify exploitation of the non-human, but the destruction and exploitation of the human too. The Crusades, Spain's colonization of the Americas, and South Africa's Apartheid are just a few examples of exploitation of entire nations justified by recourse to the Bible[4].

In the second chapter of Genesis the Earth was barren when God made Man. Having made him, He then planted a garden in which he put His creation, and grew trees; all trees pleasant to look at and good for food (Gen. 2:9). It became man's job to tend the garden; a gentle occupation since the plants were domesticated. Farming only became necessary after the Fall; when the humans disobeyed God by eating of the tree of the knowledge of good and evil, and they were expelled from the garden. The concept of the Fall is a vital component in the Christian tradition of nature. It was essential to the widely held belief that the Fall of man caused disorder in nature and a decline in its powers, clearly opening the door for science and technology to step in and help.

Life was not easy for people after the Fall; work was necessary in order to survive, evil flourished, and God decided to exterminate life on the planet. God saved Noah and a couple of each kind of animal from the destruction of the flood, and as they left the ark Noah made a sacrifice of beasts and birds of every kind, which placated God (Gen. 8:20).

> "God blessed Noah and his sons and said to them,`Be fruitful and increase and fill the earth. The fear and dread of you shall fall upon all wild animals on earth, on all birds of heaven, on everything that moves upon the ground and all the fish in the sea; they are given into your hands. Every creature that lives and moves shall be food for you; I give you them all as once I gave you the green plants. But you must not eat the flesh with the life, which is the blood, still in it. And further, for your life-blood I will demand satisfaction; from every animal I will require it, and from a man also I will require satisfaction for the death of his fellow man. He that sheds the blood of a man, for that man his blood shall be shed; for in the image of God has God made man. But you must be fruitful and increase, swarm throughout the Earth and rule over it" (Gen. 9:1-7).

Swarming over the Earth and ruling over it is precisely what humans did. The anthropocentrism of these passages is explicit. Humans are special, for they are made in the image of God. Where it is permissible to kill and eat animals, it is forbidden to spill the blood of humans; anything that does so must expect retribution. All other

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4 We are not concerned here with whether such justification was itself correct, only that it existed.

living creatures are reduced to the level of a menu. This theme of the Earth as a place designed for human habitation is repeated elsewhere in the Old Testament:

> "Thus says the Lord,
> the creator of heavens,
> he who is God,
> who made the Earth and fashioned it and himself fixed it fast,
> who created no empty void,
> but made it for a place to dwell in" (Isa. 45:18).

Similarly:

> "What is man that thou shouldst remember him,
> mortal man that thou shouldst care for him?
> Yet thou hast made him little less than a god,
> crowning him with glory and honour.
> Thou makest him master over all thy creatures;
> thou hast put everything under his feet:
> all sheep and oxen, all the wild beasts,
> the birds in the air and the fish in the sea,
> all that moves along the paths of ocean" (Psa. 8:4-8).

And:

> "The heavens, they are the Lord's;
> the Earth He has given to all mankind" (Psa. 115:16).

White's paper was published in the late sixties. Since then there has been a great deal of debate on the position of people in relation to the rest of nature within the religious context (Cobb, 1980: Carmody, 1983). Many have challenge the `despot' relationship, and suggest that the correct interpretation, if the Bible is taken in context, is that humans are the stewards of nature, and are there to look after it (Passmore, 1980). This does not, however, alter the perception that people are superior to nature. They are not to be regarded as a part of it, and thus are free to establish power relations which exploit nature for their own benefit. There is really little difference between the despot and the steward position, except that one is perhaps more benign than the other. Either way nature is still placed well below human interests on any scale of importance.

This has been summed up succinctly:

> "The theme that man, sinful though he be, occupies a position on Earth comparable to that of God in the universe, as a personal possession, a realm of stewardship, has been one of the key ideas in the religious and philosophical thought of Western civilization regarding man's place in nature" (Glacken, 1967, p. 155).

Historical Philosophical & Scientific Support for the Dominant Western Environmental Paradigm

Sumaria

The relationship between humans and their environment has been a source of debate throughout recorded history and quite probably before. The notion of a designed earth, made for all earthly entities, for all living creatures, or sometimes only for humans, is particularly ancient, and can be traced reliably to the mythical system of the Sumarians, whose existence in the fertile crescent is often regarded as the earliest recorded civilization (Kramer, 1959). As a people without a well developed sense of history or progress, they evolved a system of invisible deities who tended the Earth (including entities like mountains, irrigation furrows, and ploughs) much as humans tended their cities and towns. Since the tasks of these deities were far more complex than those performed by humans, they were accorded greater powers. For the Sumarian way of life, it was sufficient explanation - the thought that the final, well-structured Sumarian life-style was a result of centuries of experiment and toil, creating cities out of swamps - seemed not to occur to the inhabitants of the cities. For them life had always been that way, since the gods had decreed it so (Kramer, 1959). The idea of a complex and continuing interrelationship between humans and their environment; of humans changing it and being changed by it, is a more involved concept than the `designed earth' interpretation in that it requires a well-developed sense of history (Glacken, 1967).

Ancient Egypt

The conception of the Earth as orderly and harmonious, created by the gods for the use of humans is very old indeed. The Memphite Egyptian theology of the Old Kingdom, dating from some two millennia before the Greeks and the Hebrews, proposed an articulate intelligence behind the creation. An text several thousand years old suggests an anthropocentric, a human-centred, purpose to the creation:

> "Well tended are men, the cattle of God. He made heaven and Earth according to their desire, and he repelled the water monster (at creation). He made the breath (of) life (for) their nostrils. They are his images that have issued from his body. He arises in heaven according to their desire. He made for them plants and animals, fowl and fish in order to nourish them. He slew his enemies and destroyed (even) his (own) children when they plotted rebellion (against him)" (In Wilson, 1951 p. 235).

Classical Greece

The Greek roots of modern science and philosophy are well recognized (e.g. Randall, 1987), but their importance cannot be over-emphasized. It is doubtful that any one of the founding fathers of science as it is known today; Newton, Bacon, *et al*, was unfamiliar with Greek texts and traditions. The texts contained vast stores of knowledge, ranging from abstract theories on the origin of the Earth to practical techniques of farming and medicine; for example the Hippocratic oath still sworn today by doctors.

Plato's myth of Prometheus is an early example of the separation of humans from other animals. In it the gods designed animals out of Earth and fire, and just before calling them into existence ordered Prometheus and Epimetheus to equip them with the properties they would need for life. Epimetheus volunteered to distribute the properties, and Prometheus to inspect them. The creatures were given their habitats and their niches, their different food sources, and their various means of protection, like hair, hooves, or teeth. Planned as it was to avoid the extinction of any species, animals which were preyed upon reproduced faster than the predators. When he inspected the distribution, Prometheus discovered humans had been left vulnerable, and he stole from the gods Hephaestus and Athena their artistic and mechanical skills, as well as the fire necessary to practice the arts. Not only were humans separated from nature by their practical crafts, but in stealing the arts of the gods - Hephaestus was a craftsman in metal, ivory, and jewels - did they not elevate themselves a little towards god-hood too?

The common nineteenth century argument for divine providence and an Earth designed for humans has antecedents in Xenophon's tale of Socrates. Here humans have been given eyes that they may see and marvel at the divine creation; they walk upright and may thus look at the stars, unlike the lesser animals; and from the hands come the arts. Socrates and Euthydemus together point out examples of divine foresight which prove that the Earth was indeed made to human measure. Light is provided for humans, but night is also necessary to rest. If some tasks have to be done at night (sailing, for example), stars are there to guide, and the moon to tell time and date. The Earth yields food; and the gods provided water for things to grow. They also provided fire to assist people, to keep them warm and protect them. Even the climate of the temperate region seems designed for human comfort. When Euthydemus comments that it seems as though the gods are devoted to the service of humanity, he notes that lesser animals too enjoy many of the blessings. Socrates responds that the animals themselves are there as a service to humanity. Even human senses are provided in order that people may take advantage of the beautiful and useful objects of the world. Socrates concludes his argument thus:

> " You will realise the truth of what I say if, instead of waiting for the gods to appear to you in bodily presence, you are content to praise and worship them because you see their works" (Xenophon, *transl.* 1953, p. 14).

This statement became the prototype for similar and subsequent ideas over the next two thousand years, and despite increasingly sophisticated explanation and illustration, no basically new idea was added to it (Glacken, 1967).

Aristotle's perspective of the environment was based on the belief that nature does nothing in vain. His famous doctrine of the final cause implied that it was the desired outcome which shaped a course of action. Nature was rational, and followed a rational course with some end goal in sight; a plan, much like a builder would have for a house, although infinitely more complex. Nature should thus be examined for hints of this plan; all animals, no matter how small and insignificant, being worthy of study. For example, there exists a variety of animals to make use of the variety of food and thus reduce competition. Since plants exist for the use of animals, it may be inferred that animals exist for human use (Glacken, 1967). In the final analysis then, Aristotle's final cause was disappointingly simplistic and anthropocentric.

The Hellenistic Period

The Hellenistic age was even more important in the development of Western civilization than the times of Plato and Aristotle. Indeed some have gone so far as to declare:

> "So far as modern civilization is based on Greek it is primarily on Hellenism that it is based" (Tarn, 1952, p. 1).

The period is commonly agreed to have begun with the death of Alexander in 323 B.C. and lasted until the founding of the Roman empire by Augustus in 30 B.C. (Glacken, 1967). It was a period of great excitement in the Greek world. Most of the country had been involved in some way in the campaigns of Alexander, and were familiar with the contrast between the lush Nile valley and its harsh desert border. They knew of the plant life of Persia and the deserts of Baluchistan. The forests of the Himalayas and the mangroves of the Arabian Sea had been marvelled at, and the Greeks had better knowledge of the Mediterranean region than had any of their forebears. It was a period which saw the discovery of the seaway to India, and the Roman conquest of Spain, North Africa, Gaul, and the Balkans. A central core of civilization stretched from Babylonia to Sicily, surrounded by a huge area of barbarian kingdoms, Roman provinces, and Greek colonies (Smith, 1978). Within this area, from Spain to India; planned colonization, economic planning, investment, capital, and world currencies changed the faces of the cities and the countryside. Evidence of change abounds within this period, interpretations of human impact on nature are few (Marsh, 1885). The philosophy was of activity, optimism, and a desire to improve the land. The mood; confidence and faith in the unlimited capabilities of human reason (Thomas, 1956).

Cyprus and other areas were de-forested in the process of ship-building, while in other places trees with economic value, like olive and laurel, were introduced. Agriculture and related activities were the most important sources of wealth in the ancient world. A special servant, the *oeconomus,* was employed on estates to inspect irrigation systems and supervise sowing of crops, as well as planting, guarding, and harvesting of trees and bushes. The *oeconomus* was responsible for hiring sub-contractors for special tasks such as protecting bushes from sheep. The prevailing attitude saw economically altered landscapes as pleasing to the eye: canals appeared, swamps were drained, and rivers re-routed. In one case a large lake was drained by army engineers in order to increase the arable land area of Greece (Glacken, 1967).

In Egypt too, the economic system:

> "Was inspired by one motive, the organization of production, with the main purpose of making the State, in other words, the king, rich and powerful" (Rostovtzeff, 1922, p. 316).

It was a period which saw an influx of Greek settlers to Egypt, bringing with them their taste for wine and woollen clothes. Vineyards and sheep became important to the economy of the country, changing the landscape. Engineers and architects erected cities and temples; exploiting mines, quarries, and forests, and the Romans introduced urban life of the Greco-Italian type to areas that had previously been village and tribally based.

The Hellenistic period changed the face of the world with its optimism and industry, and yet it sought not to sever its connections with nature. The importance of living within the dictates of nature was stressed regularly, and the cities of the period were well endowed with parks and gardens. It was certainly a time of expansion and colonization if not of technological progress as it is understood today. Although the profit motive was becoming increasingly important, nature was an abundant good, and the benefits of having contact with nature far outweighed the costs. Cities, little towns by modern standards, were likened to beehives; bustling with industry, stimulating and exciting (Smith, 1978).

The Roman Empire

One significant effect of the spread of Greek culture was the impetus it gave to the creation of the Roman Empire. Greek settlers on Italian soil decidedly and permanently influenced the art, religion, and technology of the native Italians. Even the later preoccupation with drainage which so characterized Roman endeavor, can be traced to Greek influence (Smith, 1978).

In its turn, the Roman Empire left indelible marks on the development of Europe, and provided some of the fundamental characteristics of the Dominant Western Environmental Paradigm. Rome itself emerged at an interface of the sophisticated Greek and Etruscan worlds with the Iron Age cultures of the Italians and their neighbours. The decline of the Etruscan empire, and the lack of any strong federation between the city-states of Hellenic Greece led to increasingly frequent Celtic invasions. In 390 BC the Celts sacked Rome, resulting in a complete restructuring of the Roman Army. It moved away from cavalry drawn from the houses of the elite to heavily armed infantry, drawn from the *plebs* (Smith, 1978). By concentrating effort on military and technological domination, Rome, in the space of a few hundred years, had expanded from a city to an empire. It was an empire which set a precedent for massive colonization and exploitation, with the produce of the colonies being sent back to a capital city which could supply its one million inhabitants with free bread, oil, and circuses (Smith, 1978).

This wealth was not without a price, and it has been observed that those regions which, at the beginning of the Christian Era, the height of Roman power, were the most productive areas of the empire, suffered dramatic declines. Their productiveness was so diminished as to be almost entirely unable to support agriculture by the mid nineteenth century (Marsh, 1885). Including the once fertile soils of Persia and the middle East, Marsh comments:

> "The decay of these once flourishing countries is partly due, no doubt, to that class of geological causes whose actions we can neither resist nor guide, and partly also to the direct violence of hostile human force; but it is, in far greater proportion, either the result of man's ignorant disregard of the laws of nature, or an incidental consequence of war and of civil and ecclesiastical tyranny and misrule. Next to ignorance of these laws, the primitive source the *causa causarum* of the acts and neglects which have blasted with sterility and physical decrepitude the noblest half of the empire of the Caesars is, first, the brutal and exhausting despotism which Rome herself exercised over her conquered kingdoms and even over her Italian territory; then the host of temporal and spiritual tyrannies which she left as her dying curse to all of her wide dominion .... Rome imposed on the products of agricultural labor (sic), in the rural districts, taxes which the sale of the entire harvest would scarcely discharge; she drained them of their population by military conscription; she impoverished the peasantry by forced and unpaid labor (sic) on public works; she hampered industry and both foreign and internal commerce by absurd restrictions and unwise regulations. Hence large tracts of land were left uncultivated or altogether deserted, and exposed to all the destructive forces which act ... when ... (the soil) is deprived of those protections by which nature originally guarded it,

> and for which, in well ordered husbandry, human ingenuity has contrived more or less efficient substitutes (Marsh, 1885, p. 4-6).

From this broad indictment can be drawn a number of parallels with contemporary circumstances. In it too can be seen many of the foundations of the DWEP; rule by masculine force and militarization, for example; or the use of technology to subdue Nature, both human and non-. Even the role of religion is hinted at, a role which became increasingly apparent in later centuries.

The Middle Ages

The period of the Middle Ages is not often given much space in analyses of the development of environmental perceptions. Admittedly it was not a period marked by rapid change and development, but it was nonetheless important. It was through this long, but still energetic and active period that a number of themes arose which are still topical today. To mention just a few of them: the contribution of land reclamation to the emancipation of the common individual; the antiphonal themes of resistance to and progress of such change, with the emergence of classes and their interests - an example would be the preservation of forests as royal hunting reserves at the expense of those less well off who wanted to clear and farm the land; and the continuity of peasant competence, the peasants who had the hands, used the tools, and possessed the empirical knowledge of the plants and animals (Marsh, 1885; Glacken, 1967).

The medieval environment was one of retreating forests, marshes, and heaths. Arable land was claimed from the forests, quarries were opened largely to build the churches and cathedrals, and trees were felled for shipbuilding and use in the mines. The medieval economy was a wood-fueled one, and though coal was known, it was not highly regarded[5]. It was only the eventual destruction of the forests that forced the economy to move to its later coal base, since the amount of work required to extract coal is so much greater than that necessary for wood (Rifkin, 1980).

Just as the simple change from wood to coal necessitated a re-organization of the economy, so it has been claimed that a change in ploughing technique altered social relations. The plough used by the Romans was a scratch type, and not strong enough to turn over the soil. It could also be pulled by hand. By the 6th century the cross plough was increasingly being used. It had wheels and two blades, and not only dug a furrow, but turned over the sod at the same time. Its drawback was that it was much heavier, and required eight oxen to pull it. Such a large team was beyond the means of individual peasant families, and so co-operative teams were necessitated. Because the

5 For example, in 1631 Edmund Howes lamented that "the inhabitants in general are constrained to make their fires of sea-coal or pit coal, even in the chambers of honourable personages" (quoted in Rifkin, 1980, 73).

plough worked best in long, open fields, it was no longer practical to fence off the land into small private units. Communal farming became the norm on most feudal estates in Northern Europe by the Ninth century (Merchant, 1980).

Because it was particularly effective in the rich, river-side soils, the cross-plough resulted in the deforestation of miles of low-lying timberland. In Northern Europe population pressure placed demands on crop yields, and the traditional two-field system of farming gave way to a three-field system. Instead of half the land lying fallow for a year, only one third was allowed to. Production increased by one third, while the amount of work decreased by one ninth. Soil fertility was exhausted proportionately faster as well. Along with the three field system, horses were introduced to pull the ploughs. Horses worked twice as fast as oxen, but also required grain, not just hay. This grain was supplied from the increased yield of the three-field system. Technological progress in the form of horseshoes, modern horse collars which did not compress the animal's chest, and methods of tandem harnessing were all perfected by the eleventh century (Thomas, 1956).

The increased production from the ninth to twelfth centuries resulted in the production of surpluses, which in turn resulted in a steady increase in population. Pressure on the land increased, forests on marginal land were felled and farmed with the increasing technology, and by the mid fourteenth century the population had outstripped its energy base. Soil exhaustion and a growing timber shortage threatened production throughout Europe (Marsh, 1885; Glacken, 1967; White, 1967, Smith, 1978).

Such changes did not occur in a political vacuum. In the early medieval period agricultural practices tended toward a relatively high crop yield combined with a maintenance of soil fertility through the integration of crop planting with raising of cows, pigs, and horses. The amount of land ploughed corresponded to the manure produced by the animals, which was used to fertilize the crops. Communal resources such as woodlands and commons were regulated by officers elected or appointed by the peasant community, and their regulation exemplified the interaction between individual needs and the needs of the group as a whole (Merchant, 1980). The system did, however, contain an element of instability; force and the need for military security enabled a structure of landlords to impose itself on the agrarian society, extracting surplus labour in the forms of labour, rents, services and taxes. Although landlords did not, under stable conditions, attempt to maximize their gains, their demands were in constant tension with the peasant community for control of rights and resources. The emergence of other destabilizing forces such as population pressure and technological innovation produced conflict and altered the relationship between peasants and landlords, with significant impacts on the ecosystem itself (Marsh, 1885; Merchant, 1980).

The authority and power of landlords allowed them to centralize technological advantage, such as the access to wind and watermills, forcing the peasants to pay for their use. Between the thirteenth and sixteenth centuries conflict surfaced time and again as those in power attempted to stamp out the use of handmills and reinforce their control. Yet even these conflicts were only symptomatic of the interrelationship between population and landlord-peasant relations; larger populations increased the power of the lords. This increased pressure on the land, woodlands and marshes were converted to arable lands; communal fields enclosed as private pasture. In response many peasant communities evolved into tightly co-operative village communes, where groups of peasants voluntarily pooled their wealth into fields, which were worked on a crop rotation system. As population pressure continued to increase, the communities frequently introduced increased regulation aimed at preserving the fertility of the area; resulting not in a tragedy of the commons produced by competitive self interest, but in increasing cooperation and group regulation of the ecosystem. Imposed on this precarious balance was the feudal superstructure, which hastened the collapse of the agrarian economy and ecosystem. The practice of extracting taxes from the peasants disrupted a closed cycle, preventing the peasants from returning to the land all they took out, and resulting in declining soil fertility. This soil exhaustion meant increasing pressure on marginal land, increasing deforestation as woods were removed to permit cultivation, and increasing vulnerability to crop failure on the part of a population too large for its resource base (Merchant, 1980).

Laws aimed at preserving the forests proved ineffective (Marsh, 1885; Glacken, 1967; White, 1967; Rifkin, 1980). By the thirteenth century the people of Newcastle were without wood, and faced freezing to death. King Henry II gave permission for coal to be used. By the 1630s wood was two and a half times more expensive than it had been in the late fifteenth century (Rifkin, 1980). Cities, which had grown since the eleventh century to handle and trade the agricultural surplus faced collapse in the face of agricultural shortage. By 1700 coal had all but replaced wood as the energy base of the United Kingdom; within 150 years the same was true for the rest of Europe, with obvious implications for the social and economic systems. Each step up the energy ladder requires more work. It is harder to mine coal than it is to cut trees. Oil requires more processing and technology to be useable than does coal. Splitting atoms requires enormous energy, and fusion so much that the break-even point of energy input to output has only just been reached (Rifkin, 1980). This period between 1500 and 1700 is a crucial one, because it was here that the organic perspective of the cosmos finally gave way to the mechanistic model (Merchant, 1980).

THE GREEN PARADIGM

Progress, in the modern sense of the word, was certainly made throughout the Middle, and even the Dark, Ages. It was, however, very much a result of necessity. The idea of progress as inevitable, and more particularly as desirable, is strictly a modern one, arising in the eighteenth century and gaining strength with the industrial revolution (Attfield, 1983). It must be noted, however, that there are several sides to the question of progress. It is one thing to say that over the years the human condition has improved or will improve, in knowledge or in art; it is quite another to suggest that humanity is gradually perfecting itself (Passmore, 1980). To equate progress with science and technology alone is unwarranted. There are thus potentially several different interpretations of the idea of the inevitability of progress, just as there are several possible interpretations of what progress is. While in some ways it can be traced back to the Greeks, in other ways it is a strictly modern phenomenon. In many ways the modern sense of the inevitability of progress is based on historical experience and evidence, but is frequently without an analysis of the historical causes of such changes. Population growth, for example, provided much of the impetus for technological development.

There was, broadly speaking, an increasing optimism throughout the Renaissance of the seventeenth and eighteenth centuries that increasing human knowledge meant increasing control over nature. The theoretical science, theology, and philosophy of the day emphasized the role of changing or controlling nature as the expected function of the human position in the scale of being (Glacken, 1966, 1967). The two threads began to intertwine. The idea that progress was inevitable led naturally to the assumption that more progress was better. Evidence of increasing power over nature joined with this notion, to create the idea that evidence of progress could be found in increased control over nature. Eventually, progress came to mean little more than control over nature, and since progress was by then seen to be inevitable (and thus good), control over nature became a goal in itself. Power and dominion over nature was proof that one was part of a progressive society.

If one is attempt to pick out vital strands in the development of the Dominant Western Environmental Paradigm, with its mechanistic, anthropocentric approach, then the legacies of two of the architects of that approach are central: Bacon, and Descartes. There were others, of course, but it was primarily interpretations of the work of these men which shaped the present paradigm, and to whom the modern faith in the power of progress can be traced (Leiss, 1972; Roszak, 1972; Attfield, 1983). Nor were they proven wrong in their belief that the passage of time would see increasing human control over nature, and that this could progressively improve the human lot. Their faith was not, however, in the inevitability of progress, although by supplying the grounds for hope in scientific advance they opened the door to this belief. Their quest was rather for knowledge, on the grounds that it was a necessary, if not sufficient, condition of progress (Attfield, 1983). Bacon makes repeated pleas for increased understanding of nature, and likens human ignorance to the second fall of humankind. He exhorts people to "unroll the volume of creation". His *Novum Organum*, published in 1620, attacked the Greek tradition on the grounds that it had not produced one valid experiment intended to relieve the human condition. Bacon's philosophy was to gain control over nature by cultivating the arts and sciences and encouraging invention. This he saw as an integral part of religion, likening experimentation to the creation of light on the first day; a way to alleviate the pain of the second fall. The first, the "sin of our first parents" was of central importance in Bacon's science, as is apparent from the closing lines of *Novum Organum*:

> "For man, by the fall, lost at once his state of innocence, and his empire over creation, both of which can be partially recovered even in this life, the first by religion and faith, the second by arts and sciences. For creation did not become entirely and utterly rebellious by the curse, but in consequence of the Divine decree, "in the sweat of thy brow shalt thou eat bread," she is compelled by our labours (not assuredly by our disputes or magical ceremonies), at length, to afford mankind in some degree his bread, that is to say, to supply man's daily wants" (Bacon, reprinted 1844, p. 398).

For Bacon human control over nature was a lofty and noble position. He saw three ambitions for people: they may want to become more powerful within their own country, something he sees as vulgar and degenerate; they may want to increase the power and empire of their country over all humanity; a more dignified ambition than the first , but still covetous, or they may work for the enlargement of human power over the whole universe, for Bacon the most sound and noble ambition (Glacken, 1967).

Rene Descartes (1596-1650) was one of the most radical thinkers of the scientific revolution. For him, mathematics was everything; what was real was mathematical, and what was mathematical was real. He argued that matter was nothing more than extension in space; it was all geometry. Sensible qualities such as hardness, colour, or weight were unnecessary; matter was extension in height, length, and breadth. The implications of this perception were profoundly important in giving the dominant Western approach to nature its scientific slant. Because the space of a geometer is infinite, the universe was by definition infinite. Because matter was extension in space, there could not be empty space; the universe must be full of matter. Since motion was possible in the universe, this matter must be divided into particles. Descartes' universe was one of infinitely divisible matter; particles had size, shape, weight, motion, and position. All explanation could be reduced to terms of matter in motion, a huge, complex billiard table (Pepper, 1984).

The logical extension of this was that what could not be measured was simply not real. Animals and humans were automata; their workings could be fully known and explored by reducing them to physics and chemistry, which naturally could be understood through mathematics. Nature itself became a machine. Through analysis, everything real could be reduced to measurable qualities, which could be expressed in terms of universally applicable principles.

The other implication this reductionist view had for science was that, if mathematics were the sole legitimate language of science, then the measure of how scientific a discipline was how mathematical it was. This resulted in the quantitative revolution, which struck social sciences only in the nineteen-fifties, and is still prevalent in many today. It remains unquestioned in many natural sciences.

There seems to be an inherently human rejection of such simplistic categorization, at least as far as humans themselves are concerned. Not even Descartes could bring himself to agree he was only a bundle of chemical reactions. Through his process of systematic doubt, he debated whether, and how, humans were different to the rest of nature.

> "But then, immediately as I strove to think of everything as false, I realized that, in the very act of thinking everything false, I was aware of myself as something real; and observing that the truth: *I think, therefore I am*, was so firm and so assured that the most extravagant arguments of the sceptics were incapable of shaking it, I concluded that I might have no scruple in taking it as that first principle of the philosophy for which I was looking. My next step was to examine attentively what I was, and here I saw that, although I could pretend that I had no body, and that there was neither world nor place in which I had existed, I could by no means pretend that I myself was non-existent; on the contrary, from the mere fact that I could think of doubting the truth of other things, it followed quite clearly and evidently that I existed; whereas I should have had no reason to believe in my existence, had I but ceased to think for a moment, even if everything I ever imagined had been true. I concluded that I was a substance whose whole essence or nature consisted in thinking, and whose existence depends neither on its location in space nor on any material thing. Thus the self, or rather the soul, by which I am what I am, is entirely distinct from the body, is indeed easier to know than the body, and would not cease to be what it is, even if there were no body " (Descartes, *Discourse on Method*, 1637, p. 28).

What Descartes had done was to formally separate mind from matter; subject from object, with profound implications for human-environment relations. Nature became something ***metaphysically separated*** from humans (Pepper, 1984). Where matter was composed of primary qualities, things objectively knowable; the mind was subjective, and attributed secondary qualities to nature. It was the formal adoption by Western science of the *Cartesian Dualism*, an idea which had been common in the history of the DWEP. This formalization was used by later belief which conceived of humans as superior to, rather than a part of, Nature.

Like Bacon, however, Descartes held no truck with the unbridled pursuit of power. Again, as in other examples, the Descartes held up within the DWEP is an interpretation, rather than the original. His regard for mathematics, for example, was not sufficient for him to wish to reduce the world to mathematical equations, or to refuse to acknowledge what could not be expressed mathematically. Rather it was as mental exercise:

> "...but while Descartes was convinced mathematics is the best proving ground for human reason, he knew he could not complete science, and certainly not morals, without metaphysics. He thus attempted to establish that human reason could attain metaphysical truth and test his abilities after proving himself in mathematics and science" (Blom, 1978, p. 27),

a far cry indeed from the reductionism for which he is so famous. Descartes hoped to confer on posterity the benefits of medicine, and at one time refused to publish his results because he feared they would result in profit to the living, rather than his aim of providing advantage to their descendants (Attfield, 1983). In this, at least, he was proved correct.

If Bacon and Descartes provided the theoretical and philosophical underpinnings for the mechanical-world model, it was Newton who provided the method. Not that he agreed wholeheartedly with Descartes; indeed his theories of motion, gravitation, and light were formulated as critiques of Descartes' explanations. What they shared, however, was the belief in the mathematical. Classical Newtonian science was analytical, experimental, and reductionist; seeking to understand the nature-machine by taking it to pieces and seeing how they worked. Nature was to be explained in terms of nothing more than matter, composed of indivisible particles called atoms in motion in an infinite geometrical universe under the influence of forces which were measurable. The principles of classical Newtonian science: universalism, analysis, objectivity, and reductionism were established as the defining characteristics of science until at least the early 20th century (Pepper, 1984).

The concept of a mathematically knowable universe appealed to the people of the time. Soon after Newton's mathematical method was published, it was being taught in all major universities, and the relationship between the precisely knowable universe and the apparently chaotic life of humans was explored. The extrapolation of the mechanical model to human affairs was chiefly the work of two men; John Locke in government, and Adam Smith in economics. Their reasoning was simple. If there were natural laws which govern nature, then there must be similar laws which govern human relations. That these were not readily apparent was for them due to centuries of interference with these laws, interference which had buried them under a mass of tradition and outdated mysticism. If things could just be left alone to sort themselves out, the system would regulate itself.

Much of Locke's critique came from a religious perspective. With God being by definition unknowable, questions were raised about the practicability of religion as a reasonable base for human affairs. The possibility of a human potential to make social improvements was explored by social theorist in the eighteenth and nineteenth centuries, but it depended on the rejection of the Augustinian doctrine of original sin; which was made explicit by Locke in his *The Reasonableness of Christianity* (Attfield, 1983). Locke refused to accept that people are born with an innate bias towards evil and depravity which only supernatural grace could remedy. In his (1690) *Essay Concerning Human Understanding* he argued that at birth the human mind is *tabula rasa*, and that knowledge was an accumulation on that clean slate of images of the environment transmitted by the senses. Humans were their experience, and changing that experience, specifically by adopting rational natural laws of social organization and rational scientific education, would change humans for the better. The potential for progress and human perfectibility was thus infinite (Pepper, 1984).

It was the function of government which was the focus for much of Locke's thought, and his application of reason, freed as it was from any `irrational' bonds, led him to a remarkable conclusion. Since society was made up of individuals who created their own meaning, its purpose must be to protect and allow for the increase of property of its members. The function of government was to allow people the freedom to use their power over nature to produce wealth. While exploitation of nature was limited insofar as it should not prejudice the rights of future generations to such exploitation, continual technological progress was seen as being able to ensure indefinite opportunities. Nature was simply a resource. Although previous philosophers had suggested that beyond a certain point property becomes a barrier to happiness, Locke argued this was not so. Because money was the medium of exchange, and would not spoil or rot if it were not immediately consumed, there was no limit to the amount of accumulation possible. He declared a person should:

> "...heap up as much of these durable things (gold, silver, and so on) as he pleases; the exceeding of the bounds of his just property not lying in the largeness of his possession, but in the perishing of anything uselessly in it" (Locke, 1967, p. 312).

Not only did Locke see ownership as a right, but the creation of wealth as a duty. Land that was left wholly to nature was, in his words, waste.

> "He who appropriates land to himself by his labour, does not lessen but increases the common stock of mankind. For the provisions serving to the support of human life, produced by one acre of inclosed (sic) and cultivated land, are... ten times more than those which are yielded by an acre of land, of an equal richness lying waste in the common" (Locke, 1967, p. 311).

Astounded by the refusal of the American Indians to exploit their riches he comments:

> "A king of a large and fruitful territory there feeds, lodges, and is clad worse than a day-labourer in England" (Locke, 1967, p. 312).

It is as though Locke refused to see any meaning to life beyond the simple hedonistic piling up of possessions. In his framework needs and aspirations, dreams and desires, are all confined; everything reduced to the pursuit of self-interest in the form of material goods (Rifkin, 1980).

Having reduced the world to a storehouse of resources, it was inevitable that an economic theory to allocate those resources would arise. In his *Wealth of Nations* Adam Smith specifically adopted the Newtonian framework when he argued that, just as the motion of heavenly bodies conformed to certain natural laws, so too did economics. If these laws were obeyed, then economic growth would result. Since the laws were natural, attempts to direct economies artificially were unnatural, causing markets to be stifled when they could not expand as rapidly as they ought. For Smith, the most efficient method of economic organization was *laissez-faire*, leaving things alone.

Like Locke, Smith believed the basis of human activity was material self-interest. If it were a natural phenomenon, then it should not be restrained by the erection of social barriers, for by operating selfishly, a surplus may be produced which would overcome scarcity. For Smith, moral actions had no place in economics.

> "Every individual is continually exerting himself to find out the most advantageous employment for whatever capital he can command. It is his own advantage, indeed, and not that of society which he has in view. But the study of his own advantage naturally, or rather necessarily, leads him to prefer that employment which is most advantageous to society" (Smith, 1961, p. 475).

One of the fundamental philosophical questions, and at the same time one of the fundamental scientific ones, is the question of what makes people human - how are they to be distinguished from other animals? This is a question which has been at the heart of science and of philosophy from the very beginning, and one to which there is still no completely satisfactory answer. In some ways the DWEP can be interpreted as an attempt at providing a framework within which an answer to this vexing question can be found. Provision of a framework, however, frequently shapes the type of outcome.

Much of the work on defining essentially human characteristics centred around the issue of the use of tools and industry. It was initially claimed that humans alone use tools, until it was discovered that all classes of animals, bar reptiles and amphibians, use tools (Beck, 1980). The definition shifted slightly to that of making tools; but again animals, again excepting reptiles and amphibians, proved embarrassingly competent. Again the argument was refined, to suggest that only humans use tools to make tools (Oakley, 1962, Beck, 1980). Some go further:

> "Man (sic) is not defined as a tool making animal. He's defined as an animal that makes tools with which to make other tools on which he becomes continuously dependent. All these three are requirements of this definition of man" (Montague, 1976, 328).

Yet while this holds, in a sense, it does not mean a great deal without a clear definition of what is meant by tool making or tool use. The argument is thus shifted slightly to what is *human* about tool making; an analysis which necessarily concentrates on the intentionality which precedes tool making, rather than the constructed result of tool use (Ingold, 1987).

> "Tool-making at the human level implies an act performed in the present which cannot be dissociated from a purposeful use of the object at some time in the future....Tool-making is *psychologically* much more complicated than tool using" (Hallowell, 1956, p. 98-9; in Ingold, 1987).

Again there is a subtle shift in the argument, which has moved from the suggestion that it is tool-making which makes people human, to discussing what is specifically human about making tools. The original question; what makes us human, remains unanswered. Instead there is an acknowledgement that there is an interdependent development, in human evolution, of tools, the hands that shaped them, and the brains that designed them (Geertz, 1965). Thus for Marx tools are "organs of the human brain, created by the human hand; the power of knowledge, objectified" (1973, p. 706). Yet while it is acknowledged that human labour may indeed have created the conditions for further adaptive modification of somatic attributes, it is incorrect to suggest that this labour caused the modification (Ingold, 1987), a point missed by Engels who, when he said that "the hand is not only the organ of labour, it is the product of labour" (1934, p. 172) intended it to be take quite literally, following a Lamarckian interpretation of inheritance.

Thus, through the use of labour and of tools, one returns to the theme of a consciously altered Earth as what is in effect a precondition for humanity, a position articulated clearly by Engels, although he was by no means alone in holding it:

> "In short, the animal merely uses its environment, and brings about changes in it simply by its presence; man (sic) by his changes makes its serve his ends, *masters* it. This is the final, essential distinction between man and other animals, and once again it is labour that brings about this distinction" (Engels, 1934, p. 179-80).

This definition proved something of an embarrassment for the more socially aware anthropologists of the present, because it appears to exclude hunter-gatherer societies from humanity, on the grounds that they do not modify their environment. Ingold (1987) gets around this by suggesting they still self-consciously co-opt it, and have established a mastery over it, thus qualifying as human. Yet in doing so he has to accept the idea that it is mastery over nature which is the mark of humanity.

One again then returns to the fundamental assumption of the DWEP, albeit by a circuitous route. Mastery over nature is the mark of humanity. There are few bodies of theory more concerned with this concept than evolution, and it is illuminating to turn to some of the fundamentals of evolutionary theory for an appreciation of their understanding of this assumption. Modern evolutionary theory is commonly called `Darwinian', not because Darwin invented the theory, which he did not, nor because natural selection, as Darwin's contribution, is the only force in evolution. Rather it is that Darwin's theory was an epistemological break from previous theories, Theories of evolutionary or historical change prior to Darwin were transformational; a system was seen to be undergoing change over time because each component of that system underwent change during its life cycle. Thus Lamarckian evolution was transformational in that it saw inner will and effort transformed in to physical alteration - giraffes grow longer and longer necks because they are continually trying to reach higher branches. Societies change as a result of the changes occurring to individual people in those societies (Levins and Lewontin, 1985).

Instead Darwin proposed a variational theory, where the organism is the object, not the subjects, of evolution. Individual members of a species differ from one another in some regard, and these variations are sorted out in terms of desirability by environmental factors. A desirable variation is regarded as more fit for the environmental conditions, and thus persists while others disappear (Levins and Lewontin, 1985). Yet these variations are random; they are the consequence of internal forces which are autonomous and alienated from the organism as a whole; forces which operate independently of the functional needs of the organism, or of its relations to the outside world (Levins and Lewontin, 1985)

One of the chief sources of inspiration for Darwin was Sir Charles Lyell, the geologist. Following on ideas presented in 1795 by James Hutton, the Scottish geologist, and opposing the catastrophism of Cuvier (who held that the features of the Earth had largely been caused by the receding waters of successive floods, a viewpoint which is an adaptation of the idea of landscapes shaped by the Noahchian Flood), Lyell proposed instead that there is a constancy of natural laws, and that processes going on in the present must have been going on in the past too. Yet while Darwin accepted the open-ended sense of time proposed by Lyell's uniformatarianism, he insisted that time was uni-directional. Because all living creatures were mutating and selecting, there could be no repetition of a particular set of circumstances, something which suggests progress, yet something which makes the hypothesis of natural selection untestable (Ingold, 1986).

While Darwin was wary of equating natural selection with a law of absolute organic progress, he was under pressure from the ideas of his time, and progress was certainly a dominant theme (Mandelbaum, 1971, Bock, 1980). His criterion for organic advancement was:

> "The degree of differentiation and specialization of the parts of organic beings, when arrived at maturity, is the best standard, as yet suggested, of their degree of perfection or highness"(Darwin, 1872, p. 288).

For Darwin, intellect was certainly one of the categories of advancement, and he unquestioningly placed humans at the top of the organic scale (Ingold, 1986). And about progress he had few doubts, placing primitive tribes at the bottom, and European nations at the top (Darwin, 1871). Yet where Darwin had hesitations about the necessity of change, going so far as to state "There is no evidence of the existence of any law of necessary development" (1872, p. 299) he was a part of, and his work was interpreted by, a progress-oriented society, which equated development, progress, and evolution.

The leading progress theorist was, of course, Herbert Spencer. Yet where both Spencer and Darwin found their criterion of evolutionary advance in the notion of structural differentiation originally used to describe the course of embryonic development by von Baer (Ingold, 1986), Spencer went on to model the evolution of life on the growth of the individual organism; ontogeny recapitulating phylogeny. The premisses of Darwin's theories were the reverse. In spite of this, for the social theorists the evolution of society was an extension of the evolution of life, an argument which necessarily placed people at the head of a unidirectional evolutionary process. But not all people.

The difficulty is that where Darwin, and even Spencer, saw problems with a theory of necessary progress (Ingold, 1986), vernacular interpretations of their theories failed to note these. Instead they were used to justify the domination of Nature in the simple extrapolation that if the essence of human-ness is the mastery of nature, then greater mastery is greater human-ness. If separation from nature is the mark of a person, then those most distant from nature (including their own) are the most human. It looks odd written like this, yet it is common wisdom in science and business - "don't let your feelings get in the way of your job".

This examination leads to an interesting observation: many of those ideas taken so for granted in Western society and in science, ideas which seem logical and inevitable, are just one way of doing things. Sometimes it is the structure of science itself which is to blame; other times it is the lack of critique by individual scientists. But the structure is such that the definition of human is left to relatively few fields, while other disciplines simply take the product as given. Geographers, for example, do not spend their time defining human-ness; they accept the position of the anthropologists as specialists in that field. Worse, they accept what could be called a vernacular interpretation of the position of anthropology.

In many cases that one way of doing things can be traced to an individual person, and often to a misinterpretation of an individual. In other words, that huge monolith of Western society has been directed through the millennia by remarkably few ideas, coming from remarkably few people. As Hume pointed out, simply because it is as it is does not mean that is what it ought to be.

The Psycho-sexual Roots of the Dominant Western Environmental Paradigm

If one sought to extract a single common feature from the perceptions which have led to the present paradigm, an obvious candidate would be the emphasis on the masculine. Feminist scholarship has a long tradition of analysis of the masculine domination of science and society, but it is not an approach which is widely discussed outside quite narrow (particularly in science) circles. This is more than a simple oversight, it is an indictment of science in terms of its own rules; the feminist perspective is internally coherent, it is logical, rational, and is capable of offering science a greater depth of insight than it may have at present. Harding (1986) goes so far as to accuse science of seeing itself as sacred in its violation of the categories it creates, a violation which conceivably removes scientists from the realm of the completely human. Examples of this "sacredness" can be found in responses to the following deliberately provocative statements:

> "A. The predictable contribution that physics could make to social welfare today is negligible, since moral and political injustices, rather than ignorance of the laws of nature, are the greatest obstacles to social welfare.
> B. "More science" in a socially stratified society tends to intensify social stratification.
> C. While individual scientists may well be motivated by the loftiest of personal goals and social ideals, their current activity in fact functions primarily to increase profit for and maintain social control by the few over the many." (Harding, 1986, p. 38).

Whether these claims are true or false is not as important as the aura of blasphemy they carry with them, an aura which is absent if "science" is replaced by another term, such as "novels", "marriage", or "publicly funded education" (Harding, 1986).

In order to appreciate the psycho-sexual roots of the DWEP an understanding of some basic concepts of feminism would be useful. Central to the issue is the distinction between sex and gender: sex is biological, gender is social. Male and female are sex categories, masculine and feminine are gender categories. What this means is that there are obviously differences between the sexes, but that the different roles and attitudes assigned to men and women go far beyond simple sex differences. Gender becomes a fundamental way of organizing human relations, it is a primary categorization. Some attitudes are generally seen to be masculine; e.g. dominance, strength, aggression, rationality, and power-seeking, while others are generally seen as feminine; e.g. nurturing, caring, emotionality, and empathy. What such categorization does is to deny the possibility of the presence of `masculine' traits in a female, or vice versa. Indeed evidence of such traits is often seen as unnatural, and may lead to suspicions of homosexuality. Imposing gender categories onto sex categories shapes society, which is why nurses are generally female and soldiers are generally male. It is also a reciprocal relationship; in its formative years (and later, though to a lesser degree) a child may well seek affirmation of its sex identity by adopting gender stereotypes, stereotypes which are assimilated into the self-image of the individual and which can shape all later interactions. In other words, simply because a child finds he is a boy, he may feel compelled to adopt all the masculine characteristics he can find, so as to confirm this discovery. At the same time he suppresses his feminine characteristics, and grows up to reinforce the stereotype. Numerous psychologists and social theorist who have studied gender identity and its definition have reached similar conclusions; femininity is defined through attachment and connection, while masculinity is defined by independence and separation. Not only that, but the masculine is threatened by intimacy while the feminine is threatened by separation (Gilligan, 1982; Hallen, 1987).

This is not to say that such formulations are completely unproblematic. If gender socialization did indeed proceed with such relentless consistency, it would be very difficult to explain why any men validate `feminine' characteristics, or vice versa. Gender identities themselves have been observed to change over time in response to changing social conditions (Blom, 1990). What is important at this point is simply that the existence of a conceptual difference between sex and gender is noted, as it is fundamental to the Eco-feminist perspective.

The implications of these insights become apparent in light of a fairly simple observation: the founding fathers of the DWEP have been, to a man, men. Even today, science (the most common framework for relations with nature) is dominated by men, generally white, generally middle class. The question scientists should have in the backs of their minds, is whether their study would have evolved differently had science been dominated by a different group, or in a situation of no domination. This is more than idle speculation. Two papers: *Cognitive repression in contemporary physics* and *The force of the pacemaker concept in theories of aggregation in cellular slime mould* provide examples of what appear to be gender based preferences for one alternative explanation over another (Keller, 1985).

In the first paper the rise of quantum mechanics is examined alongside what appears to be almost a refusal within physics to accept the implications quantum theory has for the rest of the discipline. Examination and discussion of quantum theory is left to a few physicists of philosophical bent, while the rest are content to carry on as before (Bohm, 1980), accepting the Newtonian model as practically unproblematic. Keller (1985) suggests the problem is that quantum theory is not amenable to neat solutions, and appears to operate with a different sort of rationality to that encountered in mechanical (Newtonian) normal science. Rationality is frequently perceived as being a masculine characteristic, counterpoised with intuition as its feminine opposite. An acceptance of an `irrational' explanation is thus not simply `unscientific', it is an attack on the masculine identities of the scientists involved (Keller, 1985).

Keller's (1985) second example concerns research in mathematical biology. Here an explanation was sought as to why, under certain circumstances, independent single cells of *Dictyostelium discoideum* would aggregate and form a multicellular organism. Two explanations appeared possible, firstly that some sort of pacemaker cell initiated the aggregation process and sent signals to the other cells, or secondly, that all the undifferentiated cells responded simultaneously, but independently, to the stress stimulus. Although there was no evidence for the existence of the pacemaker cells, this theory of domination was gradually adopted and the term *pacemaker* crept into the literature as a *fait accompli*. It is interesting to note that the competing hypotheses were gender different, although mathematical biology (like physics) is generally believed by its practitioners to be as free from subjective judgement as possible.

This leads to a second insight of feminist critique; not only is the world divided into masculine and feminine, but the feminine is traditionally seen as less important than the masculine. This is borne out in countless nuclear families across the globe; men work (seek power, status) while women `just' stay at home (nurture). It is a primary division of labour, separating the emotional labour from the physical/intellectual labour (depending on the occupation of the husband), and simultaneously denigrating it (WGSG, 1984; Momsen and Townsend, 1987). A further dimension, central to the argument of this paper, may thus be identified. For centuries the Western worldview has been dominated by an hierarchical picture, God as the ruling male at the top, followed by men, women, and nature (mythed as female, e.g. Mother Nature) at the bottom. The picture has survived the twentieth century revolutions in scientific thought, and remains an unconscious frame of reference (Hallen, 1987).

It is important to note that at the time of the rise of the mechanistic philosophy, it was not the only explanatory system competing for support. Although there was general enthusiasm among the natural philosophers of the time for the new science, there was less general agreement about what this new science was. Two competing philosophies may be identified, hermetic and mechanical: but it must be appreciated that we examine the shift with the benefit of historical hindsight. In reality the philosophies were so co-mingled that they often existed together within the minds of an individual (Keller, 1985). Within the hermetic philosophy, material nature was intimately related to spirit, so any attempt at understanding necessarily required a joint effort of heart, hand, and mind. By contrast, the mechanical perception sought to separate matter and spirit, hand and mind from heart (Merchant, 1980). Supporters of both philosophies were aware that the reigning Aristotelian model had to be replaced. The result was a three-cornered struggle, and not until the end did any one system look a certain winner (Pepper, 1984). The hermetic philosophy (also known as Natural Magic) was based on the 16th century works of Paracelsus, and at its high point, when practiced by the Renaissance alchemists, focused on the transformative, particularly the curative, powers of chemically prepared compounds. Although alchemy is today generally ridiculed, the popular perception is based largely on myth and fabrication. For the alchemists of the time there was nothing arcane or mystical about their methods; anyone who worked hard could have access to them. John Webster, a Paracelsian, a surgeon, and a chaplain in the Parliamentary Army advocated:

> "youth may not be idely trained up in notions, speculations and verbal disputes, but may learn to inure their hands to labour, and put their fingers to the furnaces...that they may not grow proud with the brood of their own brains, but truly taught by manual operation, and ocular experiment, that so they may not be sayers, but doers, not idel speculators, but painful operators; that they may not be Sophisters and Philosophers, but...true Natural Magicians, that walk not in the eternal circumference, but in the centre of nature's hidden secrets, which can never come to pass, unless they have Laboratories as well as Libraries, and work in the fire, better than build Castles in the air" (1654, in Keller 1985, p. 106).

It was chiefly different to the Newtonian framework in that it did not seek control and domination of Nature, but attempted rather to work with it. Where the emphasis in the mechanistic approach was on separation and distance from nature, the Paracelsian image was one of conjunction of mind and matter, the merging of male and female. The texts of Natural Magic frequently use marriage as the metaphor for other relationships; like mind to matter. Giambattista della Porta, writing in the 16th century:

> "The whole world is knit and bound within itself: for the world is a living creature, everywhere both male and female, and the parts of it do couple together...by reason of their mutual love." (in Keller, 1985, p. 48)

and Paracelsus himself:

> "A man without a woman is not whole, only with a woman is he whole...both are of the Earth and form together one whole.... Similarly, man and remedy... together form one whole.... In this sense, the disease desires its wife, that is, the medicine.... Both must be united to form a harmonious whole, just as in the case of man and woman" (quoted in Keller 1985, p. 49).

During the 1650s a number of the leading hermetic intellectuals switched sides and enthusiastically embraced Descartes' newly published mathematical framework. After 1660 the balance had shifted decisively, and by 1670 the battle was over. The mechanical-universe model emerged triumphant and dominant (Merchant, 1980).

The period of the 16th and 17th centuries saw the rise of the mechanistic world-view and its accompanying philosophy. It was the period of Bacon, Newton, Descartes, and the countless others who contributed towards the formalization of the growth of knowledge. It was, one might presume, a particularly rational period; the Renaissance, a time of logic and progress. It is interesting to note, however, that between 1500 and 1700, more women were put to death for witchcraft than all other crimes combined (Monter, 1976). While there was an economic component to the persecutions of the witches in that they were competition for the new class of physicians, this was insufficient motivation for the scale of the assault (Easlea, 1980). Some other explanation is necessary, particularly since it is by no means certain that all those condemned for witchcraft were guilty. It is not unlikely that the women may have been sacrificed to the new ideologies of gender and scientist's attempts to defend the position of science:

> "To the alchemists, God was immanent in the material world, in women, and in sexuality. To (the scientists) chastity was a condition for Godliness; and truth ... was the province of the dispassionate intellect. In their view what the alchemists took to be the sign of God was in truth the mark of the devil. The emphasis the alchemists placed on the powers of love and on the kinship between sexual intercourse and knowledge threatened to embroil the new science simultaneously in passion and heresy; it endangered science's emerging claims to purity. The witch, taken seriously as having effective powers, provided a natural focus for anxiety. What was philosophically and theologically disreputable in the alchemist was directly culpable in the witch" (Keller, 1985, p. 59).

Whatever the explanation, the result was an attack on an essentially feminine perspective of the human place in Nature. The attack focused on women who dealt most directly with nature, such as midwives and herbalists, or young women who rebelled against the male structures. It was an attack which lasted several hundred years, and resulted in the hunting, torture, and burning of hundreds of thousands of women - some estimates suggest up to a million - to the extent that in many villages only one or two women were left by the end (McCoy, 1984). Against this background, Bacon's desire to "put nature on the rack and torture her" takes on a chilling new dimension (Bacon quoted in Farrington, 1970).

Sexual imagery was common during the formative years of science. For Bacon (1960) Nature was very much the woman whose secrets "need to be penetrated"; one of his lesser known works is entitled *The Masculine Birth of Time*. Another 17th century scholar, Henry More, a Fellow of the Royal Society, described the challenge of Nature: "We must break open her private closet and pierce into her very centre", while Thomas Vaughnan, also a notable 17th century scientist, described the challenge thus:

> "I summoned nature; pierced through all her store:
> broke up some seals, which none had touched before;
> her womb, her bosom, and her head,
> where all her secrets lay abed"
> (quoted in Easlea, 1981, p. 84 & 89).

Easlea[6] himself goes further. He sees

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6 Brian Easlea was a nuclear physicist who became disillusioned with the futility of making nuclear weapons and decided to research the philosophy of science

> "science as a kind of surrogate sexual activity in which scientists can penetrate to the hidden secrets of an essentially female nature, thereby proving their manhood and virility without necessarily running the risk of attempting the same with real, live, and perhaps far from passive women" (Easlea, 1981, p. 83).

The idea is not without merit. The telegram relating the first successful test of the hydrogen bomb said simply; "It's a boy."

The gender implications inherent in the development of science have been touched on, albeit briefly, but these implications may extend to the present day reproduction of scientists (Hallen, 1987). In other words, the gender implications of the scientific method may self-reinforce and select future scientists who will carry on the approach, and, it could be argued equally, in business or in politics, although these examinations will not be carried on here. This is more than a simple absence of women in science[7], it involves an examination of the myth-like beliefs which underlie the scientific reality. The beliefs are all-pervasive; Evelyn Keller, author of *Reflections on Gender and Science,* herself a professor of mathematics and feminist philosopher, relates how her five year old son came home one day and confidently asserted that "Science is for men!" (1985, 77).

It must be remembered, however, that while most scientists are men, not all men become scientists. Only a small percentage of the population are sufficiently attracted to science to make it their careers. Would it be taking it too far to suggest, as has been done, that a science which advertises itself as offering a reality in which subject and object are unmistakably distinct might be seen as particularly attractive by individuals (male or female) who are anxious or concerned about loss of personal autonomy? To take the argument further: would not a characterization of science which appears to gratify particular emotional needs (and even scientists have emotional needs) lead to a self-selection of scientists which would perpetuate and reinforce that same characterization? (Keller, 1985).

Psychological research seems to support such a contention. Scientists, particularly physical scientists, tend to score high on `masculinity' indices. They tend overwhelmingly to have been loners as children, low in social interests and skills. In both male and female scientists there is a frequent observation of a distant relation with the mother (Keller, 1985) often combined with "open or covert attitudes of derogation" (Roe, 1956, 215).

It must be stressed that science is a broad term, and scientist are an heterogeneous group. Observations of this nature are by no means binding on the

7 This phenomenon is widely documented in almost all feminist critiques of science.

group, nor indicting of the scientific method by themselves. They are, however, interesting points which should be borne in mind in light of science's frequent claims to objectivity. It is probably more than a coincidence that these claims support Bacon's perception of science as "a chaste and lawful marriage."

Conclusion

The Dominant Western Environmental Paradigm hinges on a few fundamental suppositions about Nature, and it uses these to guide its actions in relation to Nature. What have been outlined here are some of the most common - that people are superior to nature rather than a part of it; that they are entitled to treat nature as they like; that nature was created just for them; that nature can be understood as a machine; that it is the human role to use that machine, to run it for the good of humans. And finally, (and most arrogantly) that humans are capable of actually doing just that. All of these ideas cluster around that central axiom, that people are ontologically separated from nature; all can be regarded as refinements of this central idea, and all, in some way, use this axiom to justify their interpretations. Disproving the axiom is denying these refinements their justification for existing. It would significantly change Western society.

All of these ideas are commonly encountered within the DWEP. They are used, singly or in groups, when people are faced with questions of how to act in relation to nature. They are continually entrenched by the simple act of living within the DWEP. In spite of this, however, they all have roots. Many of these ideas which are so entrenched within the Western lifestyle as to appear natural, right, and unchallengeable can be shown to have emerged from the mind of an individual. They are human constructs, and as human constructs they must be understood in context - it is not sufficient simply to adopt the germ of an idea without understanding where it came from. The ideas of Bacon, Newton, and Descartes were born of far more lofty motives than the exploitation of Nature they are now used to justify. Even they, however, were products of their societies.

All the ideas of the Dominant Western Environmental Paradigm are human constructs. Some of them, like the place of Descartes and other famous figures in the history of science, are readily acknowledged (Leiss, 1972; Roszak, 1972). Some, like the gender distinctions, are hidden assumptions which some may deny exist at all. Not everyone who operates within the DWEP need necessarily hold all the perceptions to be true at all times. It is the nature of a cultural paradigm that a supporter has evidence from many fields to use to corroborate a point. Some points have been made in recent times, others carry with them the authority of millennia. Simply because they are old does not mean they are correct - few would argue that today we know more about the world than people did then. If this is the case, then one should approach these axioms, these foundations of the DWEP, with care. One should at all times realise that there is a possibility, if not a likelihood, that they are incorrect.

Chapter 3

Implications of, and Anomalies within, the Dominant Western Environmental Paradigm

Introduction

The DWEP is based on the assumption that the essence of being human lies in control of Nature. Philosophy, science, and religion have been interpreted to support this assumption, have been guided in their analyses and internal development by it, and have at times consciously sought to support it. The assumption has attained the status of a cultural paradigm, and, it might even be argued, an ideology or a world view. There is a reciprocal process at work in this; science has in no small way been responsible for the creation of the DWEP, and the DWEP has similarly shaped science in its own image. Where science produces evidence which challenges the assumptions of the DWEP, these are de-emphasized, sidelined, or ignored entirely. It is not so much the existence in science of theories which uncritically support the DWEP, it is that theories are interpreted so as to offer support. It is not what is being said that matters as much as what is being heard. It is the implications of interpretations which matter most. How theories like evolution and approaches like Cartesianism are woven together to produce a new fabric. How the DWEP supplies a pattern against which threads, like actions or ideas, are judged; if they fit the picture they are assimilated into the tapestry, if they do not they are discarded. How concepts like control, power, and domination are threads which run through the fabric of the DWEP, and how the assumptions of the DWEP are most strongly supported in those social organs most concerned with power. How all these fit together and have produced a framework within which Western society relates to Nature, and the implications of this framework, including its anomalies. All this is the focus of this chapter.

Science as a cultural paradigm

Science has clearly played an important role, historically, in the formation of the DWEP. It has provided overt and covert support for the idea of separation from nature, both through its method and through its provision of `solutions' to `problems' posed by nature. It has provided the physical means with which to control parts of nature. And in the provision of these means, it has supplied a spirit of anthropocentric arrogance. The ability to fill a bath at the turn of a tap does a number of things. It compartmentalizes problems, allowing us to forget that the water had to be piped in from somewhere else, and as a result that particular place is now short one baths' worth of water. It deludes us in to thinking that we have total control over water; that we need never really face water crises, or even that emptying oceans is only emptying baths on a larger scale. It also tells us how far we have come when we think of all those who cannot fill baths at the turn of a tap, and provides us with a vision of never ending progress and new ways to fill baths.

Levins and Lewontin (1985) argue that `evolutionism' has emerged as an ideology in the last two hundred years since it was developed as a theory of life. This `evolutionism' has permeated all the natural and social sciences, including biology, anthropology, thermodynamics, linguistics, cosmology, and geography. As a world view it is seen to encompass the hierarchically related concepts of change, order, direction, progress, and perfectibility. The whole hierarchy need not always be present; theories of the inorganic world tend to focus on change and order, while social theories add progress and even perfectibility to their analyses (Levins and Lewontin, 1985).

This hierarchy is not a world view, a cosmology, or even an ideology by itself - it is simply too narrow. It is, however, a crucial component of the Dominant Western Environmental Paradigm, and the hierarchy is certainly one which exists in normal science and in the axioms of Western society. It is thus worth exploring in more detail[1].

Change

Although all evolutionary theories are theories of change, the assertion that the past was different to the present is not in itself evolutionary. Catastrophism, for example, can be a non-evolutionary theory of change. On the other hand the theory of organic evolution assumes that the processes of mutation, recombination, and natural selection are the driving forces of life and will continue as the characteristic features of living organisms as long as organisms live. Indeed Levins and Lewontin (1985) argue that a committment to the evolutionary hierarchy is a committment to a belief in

1 Although this dissertation does not support Levins and Lewontin's (1985) assertion that the hierarchy is a cosmology, this section examining the hierarchy naturally draws heavily on their work.

instability and constant motion of systems past, present, and future. This belief was behind the bourgeois revolution of the eighteenth century:

> *"Tout change, tout passe, il n'y a que le tout qui reste"* (everything changes, all things pass, only the totality remains) (Diederot, 1951, p. 56)

as well as being a major part of the socialist revolutionary ideology:

> "Motion in the most general sense, conceived as the mode of existence, the inherent attribute, of matter, comprehends all changes and processes occurring in the universe, from mere change of place right up to thinking" (Engels, 1943, p. 69).

Levins and Lewontin (1985) see the growth in an ideology of change as a necessary outcome of the change in power relations in Europe which saw the collapse of the feudal system. No longer was the social system static, the rise to power of individuals based on their own entrepreneurial activities required a world view which accommodated change. They argue that an evolutionary hierarchy, which postulates the naturalness of change, is congenial only in a revolutionary society since human beings tend to interpret the natural world through categories reflecting the social organization of the dominant reality of their lives. Thus reciprocally a world view which sees change as essential is inconceivable in a social world of fixed hereditary relations.

Order

Order is perhaps the most difficult concept in the hierarchy of this evolutionary perspective, because it is the most difficult to contextualize. Change without order is a meaningless shuffling and reshuffling of cards. Imposing order is thus both necessary if people are to assume change is for the better, and artificial, since it is necessary to adopt what must by definition be arbitrary criteria. The idea of what represents order, and what categories are going to be imposed on natural systems in search of this order, will be ideologically based (Levins and Lewontin, 1985).

Direction

Once a concept of order has been established, it becomes possible to ascribe a direction to the evolutionary process in the sense of increasing or decreasing some characteristic. One of the more common characteristics is complexity, although fitness and relative fitness have been used in analyses of organic change, a category applied to human society by Spencer. Durkheim, on the other hand, saw increasing division of labour as the indication of direction (1933). Levins and Lewontin (1985) argue that of all evolutionary processes, only statistical thermodynamics and genetic evolution within populations have well-founded mathematical structures. Others, while highly mathematicized, are nevertheless based on dynamics which are totally hypothetical, even if they may at the same time contain truths or elements of truths. In the majority of cases, directions ascribed to evolutionary processes are based on pre-existing ideological commitments.

This is particularly obvious in the appeal to complexity and diversity as elements of stability, where stability is seen as indicating a mature or developed evolutionary system. If diverse assemblages of organisms are stable, then diversity is seen as a direction of evolution. Levins and Lewontin (1985) argue that, while there has certainly been an increase in diversity of species and occupied habitats since the Cambrian, different groups and families have reached peaks of diversity at different times, and no apparent increase in ecological diversity has occurred in the last 150 million years, suggesting that no empirical generalization is possible. Instead they argue that the emphasis on diversity, complexity, and stability as trends in evolution must be ideological. Where change and motion were acceptable concepts during the rise of the bourgeois and the overthrow of old orders, the new orders require a world view which will legitimate their position in a stabilized society. The bourgeois revolution is thus seen as the last step in a process of change, and increasing complexity of society is taken as an indication that stability is increasing. In order to accommodate the fact that evolution continues to occur, it is suggested that the environment is in a state of constant decay as a result of the actions of predators, use of resources, and evolutions of prey. Thus evolution is necessary in order to keep up with the changing world; those which fail fall by the wayside (Levins and Lewontin, 1985).

Progress

This picture of the world is different to the one held by evolutionists of the nineteenth century. For them evolution was a change from worse to better, inferior to superior. Thus Herbert Spencer, who was more concerned with the change in social systems than purely physical ones, equated progress with change itself:

> "From the earliest traceable cosmical changes down to the latest results of civilization, we shall find that the transformation of the homogeneous into the heterogeneous is that in which progress essentially consists" (1915, p. 10).

The development of the idea of progress has already been discussed in earlier chapters, and will not be repeated here. What is important about the concept, for Levins and Lewontin (1985), is that it contains an implicit moral judgement. The idea of progress requires a theory of value to support it, otherwise evolution would merely be a change, for better or worse. Of course the provider of values is human, leading, in the words of Levins and Lewontin to a situation where:

> "Man (sic) leads all the rest. The shibboleths of progressivism are the superiority of man in the cosmos, of

> industrial man in the world economy, and of liberal democratic man in world society. We have, then, a kind of Whig biology, which sees all evolution as leading to entrepreneurial man" (1985, p. 24).

Perfectibility

Although Darwin stopped short of the view that evolution would result in the best of all possible worlds, he was, at the end of *Origin of Species*, optimistic that it at least led towards perfection. Social adaptation of evolutionary thinking in the twentieth century is often less hesitant. Outside biology many fields suggest a final state to which a system is moving; the state of maximum entropy of thermodynamics, for example. Some social systems are explicitly progressive and perfectionist, Marxism, for example. A feudal stage is succeeded by a bourgeois revolution. This releases productive forces which lead to a proletarian revolution and a proletarian society which maximizes social entropy (Levins and Lewontin, 1985).

On the other hand the existing capitalist system sees present society as a move towards a state of perfection; a move which would be hastened by the freeing of trade. Thus Smith's belief in the perfection of a society based on *laissez-faire* economics, and Marx's belief in the perfection of his particular interpretation both owe debts to the ideology of their period. Both are economic systems based on nineteenth century ideological interpretations of science. More than that, however, in the reciprocal process by which a cultural paradigm is woven, both have become economic systems which legitimate their own hidden assumptions; that *homo economicus* is at the head of the evolutionary pyramid. Although there is dispute between the schools, and they are more commonly characterized as polar opposites than as variations on a theme, proponents of each, while they may disagree on what counts as an economic truth, nevertheless both regard an economic truth as an ultimate truth for life on the planet.

Neo-Darwinism, sociobiology, and the selfish gene

If science can legitimate economics as the ultimate truth, then the reverse of this must imply that science is subordinate to economics. It nevertheless remains in the interests of *homo economicus* to continue to be legitimated by science, particularly evolutionary theory. It is against this hidden assumption that it is necessary to examine post-Darwinian developments in evolutionary theory.

The essence of the Neo-Darwinian approach depends firstly on the conceptual separation of the organism from its environment, and secondly on the supposedly random nature of variations on which natural selection acts (Ho, 1988). Prior to Darwin, the search for natural order inherent in biological forms was the aim of rational taxonomy. Under Darwin's influence this gave way to phylogenetic systematics, which instead has the aim of tracing genealogies along imaginary adaptive pathways of transformation. Neo-Darwinism is a synthesis of Darwinism with Mendelian and molecular genetics which arose in the 1950s and 1960s, and which undermined much of the work on causal analysis of development which had been begun by Wilhelm Roux at the beginning of the twentieth century. Instead, within the metaphor of evolution, genes were regarded as the ultimate cause of development, and the study of development collapsed largely into a search for genes (Ho and Fox, 1988). It is interesting to note that there is a conflation at this point of the ideas of evolution, of progress, and of development, one which bedevils the DWEP. This conflation has significant impacts on the structure and goals of societies contextualized within the DWEP.

The theory of natural selection, which was Darwin's real contribution to the debate on evolution, suggests that if one assumes the presence of heritable variations in individual organisms, their capacity for geometric (Malthusian) increase, and the limited resources of the environment, there must necessarily be competition for survival and reproduction in which the `fittest' variants will win. As a result of this process natural selection will lead to an improvement of the species over a number of generations, and if this process continues for long enough a new species may emerge, particularly if there is a change in environment (Ho, 1988). On to this Darwinian framework, Neo-Darwinists add the theory of Mendelian genetics, which suggests that heredity is controlled through genes, which are discrete particles, and that variations are a result of random mutations in those genes (Ho, 1988). Darwin had problems with the separation of organism and environment which natural selection appeared to imply, the picture of organisms as objects on which selective forces operate. Neo-Darwinism using Weismann's doctrine of the independence of germplasm combined with Mendelian genetics finally made the separation absolute. The organism came to be regarded as a collection of phenotypic characteristics, something which counted little in itself, and was but a shadow of the genotype, the underlying essence which is insulated completely from the environment and which is passed on more or less unchanged between the generations (Ho, 1988).

The discovery of the double helix led to the identification of the genotype with nuclear DNA. The argument was advanced that this DNA contained the genetic programme encoding all the necessary information which is decoded to construct a phenotype during development. With this `development' is reduced to an initial and a final state; while natural selection operates on the phenotype, only the genotype matters - all that counts is the genes which are selectively propagated, and organisms become mere ghosts of a departed quality (Ho, 1988). The question of randomness is a particularly important one since it is amenable to an ideological interpretation which equates a lack of connection with a lack of responsibility, especially between human and non-.

The difficulty with this perspective is that not only are Weismann's doctrine and the randomness of variation outmoded concepts, albeit ones which may retain some useful insights (Manyard-Smith & Holliday, 1979; Pollard, 1984; Webster, 1984; Pollard, 1988), but that when organisms are examined as living, breathing, acting, developing, and in tune with their internal and external environments, it is apparent that the fit between organism and environment must arise through some reciprocal feedback process operating on time scales which vary between fractions of seconds and hundreds of generations. Organisms adapt to environments and in turn adapt environments to themselves in continuous processes. They are interconnected wholes; psychology with biology, germline with soma, genotype with phenotype. Each of these wholes is a part of a continuity which is not only biological, but a reproduction of society, of environment, and of culture (Sinha, 1984; Gray, 1988; Ho, 1988).

Although Neo-Darwinism has attracted considerable negative comment in biology recently, it is not this which is of chief interest at this point. What is more interesting is how the assumptions of Neo-Darwinism; particularly that of `survival of the fittest' and the randomness and reductionism Neo-Darwinism entails have become part of the way Western society regards its interaction with Nature. They have been completely integrated into the tapestry which is the Dominant Western Environmental Paradigm.

Sociobiology is often called Social Darwinism, and although it is dependent for much of its analysis on Neo-Darwinism, there are grounds for arguing that it was Spencer, not Darwin, who was the first sociobiologist. For Spencer, society was a superorganism; one which not only possessed the attributes of evolving organization like internal heterogeneity and coherence, but which is also consubstantial with the elements of which it is made; the individual organisms. `Super' is thus not a transcendence of the organic, it is an extension of organization beyond the individual. Furthermore, in this aggregation of organisms into superorganisms, Spencer saw no new social purpose over and above the separate purposes of the individuals themselves (Ingold, 1986), a statement which suggests an attitude which is remarkably similar to that of Locke's. In this he was following the well established traditions of liberal Western society, where society is constituted as an instrumental adjunct to the satisfaction of extrasocial and hedonistic ends, the pursuit of pleasure and the avoidance of pain. Spencer proposed that as society advances in terms of coherence and heterogeneity, its members are less and less required to submit to the authority of the group. Where in the beginning the interests of the group are geared towards survival and conquest in intergroup struggle, and organization is chiefly militaristic, with the interests of the individual subordinated to the despotism of the collectivity, this changes over time (Spencer, 1882). He suggests that progressive differentiation will lead to a gradual decline of militarism in favour of peaceful coexistence. The result of this will be the individual being freed from collective pressure and the creation of what Spencer calls a industrial form of group solidarity. As this industrial form advanced, each individual would be able to best pursue their private interests by entering into contracts with specific others, who would also gain from the transaction. As a result the typical social relation would be purely economic, lacking all regulation and resulting completely from the initiative of the parties involved. Industrial society would consist of a complex network of these relations (Spencer, 1882).

Durkheim (1933) objected to this scenario, suggesting that no society thus constituted could survive unless every contract were underwritten and regulated by a code of conduct which, since it would not derive from the free consent of the associating parties, would be non-contractual. In addition, as the volume of contractual relations expanded, so the amount of non-contractual relations would grow, leading to increased State intervention. Thus where Spencer saw an inverse relation between state powers and division of labour, Durkheim saw them growing together (1933).

In its present formulation sociobiology, as the study of animal behaviour from an evolutionary perspective, derives directly from orthodox Neo-Darwinian evolutionary biology (Ruse, 1980). As such its major flaws arise from, and are present in, Neo-Darwinism, and are more serious when extrapolated to the social sciences (Saunders, 1988). Given that Neo-Darwinism places emphasis on the reduction of characteristics to genetics there are two problems which are immediately apparent. The first is the problem of selective advantage, which these genetic traits are presumed to allow - what is or is not a behavioural advantage would seem to depend more on the circumstances of a society than anything else, and when this aspect is reduced to behavioural details such as varieties of human sexual behaviour (Weinrich, 1977), or the tendency of grandparents to annoy their children by spoiling their grandchildren (Fagen, 1976), it begins to get a little tenuous (Saunders, 1988). In the second place, the connection between the gene itself and the behaviour is infinitely longer and more complex than a gene for changing the colour of a moth's wings. Behaviour rests on environment, otherwise there would not be any learning process. The connection between a single behaviour and a single gene is simplistic, but although most sociobiologists would deny assuming `one gene/one characteristic' (e.g. Bateson, 1982), this is not what appears in practice when sociobiologists refer, for example, to `the gene for altruism'. Assuming this is shorthand for a more complex analysis, others ask just what is this greater complexity? (Saunders, 1988).

Dawkins (1976) and Bateson (1982) both argue that a behavioural trait is determined by a single gene. While they do not suggest that a single gene is the sole cause of a behavioural trait, they argue implicitly that all other things being equal, a single gene can make the difference between an animal behaving in one way or another. The key is the understanding that all other things are equal, a point neither makes explicit. As Saunders puts it:

> "Like other modern Neo-Darwinists, sociobiologists are happy to allow that there are lots of other things besides genes in evolution, so long as they aren't actually expected to take any of them into account" (Saunders, 1988, p. 284).

This is not to deny completely the possibility that there might be some human behavioural traits which are caused by just one gene. However the burden of proof lies firmly with the sociobiologists, and it has not been taken up. Part of the problem lies in the definition of a trait - it is one thing to argue that in social science it is possible to identify behaviours like aggression and altruism. It is another entirely to suggest that they are genetic traits which may confer a selective advantage (Saunders, 1988).

The danger of sociobiology is that a poor social theory can legitimate unjustifiable views about how to act. In my own experience I know of the managing director of one of South Africa's largest mining houses, employing hundreds of thousands of workers, who has read Dawkins' (1976) *The Selfish Gene*, and found it inspirational. One can scarcely imagine a more direct impact.

Neo-Darwinist explanation follows a pattern of examining a trait in an organism, and then trying to fit it in to the theory (e.g. Ruse, 1982). In sociobiology it is not possible to measure the adaptive significance of any particular trait: altruism, for example. As a result it is necessary to postulate one. But with a little bit of imagination it is possible to think of a selective advantage for practically any trait. Even homosexuality, which at first glance should not convey an adaptive advantage on the grounds that reproductive opportunities are limited, has been explained in Neo-Darwinism by suggesting that since they are freed from parental responsibilities, homosexuals can, for example, act as helpers to close relatives (Trivers, 1974; Wilson, 1975), and at one time sociobiology was even used to explain the 'low intelligence of the Irish' (in Saunders, 1988). The difficulty is that it is possible for sociobiologists to fasten on to some trait which 'everyone knows' is innate: male dominance, aggression, or such like, and then think up a selective advantage. Since it is impossible to prove the suppositions wrong owing to the way the theory is structured, sociobiology can provide support for the existence of any trait whatsoever, and thus provide scientific authenticity to the prejudices of the investigator (Saunders, 1988).

Sociobiology not only confirms certain views on human nature, it also contributes towards their creation. Darwinism emerged in the harsh economic climate of Victorian England, and it imbibed a great deal of the ethos - the emphasis on competition, on individual success and failure, and on struggle. Neo-Darwinism continues the trend, with the same metaphors: cost-benefit analysis, investment, and conflict of interest, for example (terms which are becoming increasingly common in Environmental Science, particularly impact assessment). Through sociobiology these ideas are moved back in to social theory, except that by then it has been forgotten they originated in a particular culture, and instead are regarded as value-free assumptions of natural science (Saunders, 1988), a point also made by both Engels (in a letter to Lavrov) and Marx, who saw the entire exercise as a sort of conjuring trick, transferring from society to nature Hobbes' doctrine of `bellum omnium contra omnes' combined with the bourgeois economic doctrine of competition and Malthus' theory of population, and then transferring the whole structure back to society again as a sort of justification by nature of the social status quo (Ingold, 1986). Thus for sociobiologists the essential characteristic of humans and all other organisms is selfishness. As a result the sociobiological literature is overly concerned with topics like aggression, male dominance, war, and other unpleasantries, all of which its adherents are happy to confirm are a part of human nature, based on their unfalsifiable theory.

Saunders concludes:

> "I should stress that in criticizing sociobiology as a politically dangerous theory, I do not mean to say that all, or even the majority of sociobiologists hold undesirable political views. Some of them may, others do not; that is not the primary issue. It is the theory itself which is politically unacceptable, and for good scientific reasons. All the same, we might ask whether it is perhaps not entirely surprising that some of us who have done considerable better than the average inhabitants of this planet would not be attracted to a theory which ascribes so much to our genes, thereby reassuring us that our favoured position is largely a consequence of our innate superiority rather than a mere reflection of the much better than average environment in which we have had the good fortune to be raised" (1988, p. 289).

The point is not so much the relative merits of these theoretical structures insofar as they are able to explain various phenomena. What is important is what they are seen to say, the assumptions which are drawn from them, especially as they are interpreted through a particular cultural paradigm. It is entirely possible that if a different cultural paradigm dominated, there would be different interpretations, or at the very least, a different status granted to results obtained. The difficulty is that even where there may be serious doubts about the validity of a particular theory, the paradigmatic framework which is culturally dominant forms what could be described as an `old boy' network, papering over inconsistencies, ignoring anomalies, and using whatever support it can to strengthen its own point of view.

The Dominant Western Environmental Paradigm is an accumulation of mutually supporting opinions on the human place in the scheme of things. As such it incorporates attitudes to nature, to the question of what makes one human, and to what people should be doing while they are here on Earth. Although many of the roots are very old, much of the framework, particularly the scientific `evidence', has its roots in the attitudes which were common during the industrial revolution. A result of this has been the subconscious elevation of economic man[2] to a position at the top of an evolutionary line; the end point for evolution on the planet. As a result, nature has become a collection of economic goods. The complex weaving process by which a cultural paradigm is created should by now be more apparent. What should also be apparent is the need to examine in more detail some of the assumptions of Western economics, not simply because this is where power is most commonly exercised and where it is concentrated (although this in itself is significant), but because the structure of the DWEP is such that economic decisions are accorded disproportionately high status in the society. Economics has become the arena in which the assumptions of the DWEP are actualized, and decisions made there are of special significance, not only because they are representative of the attitudes of the DWEP, but because of the physical impact such decisions can have. The notion of the *bottom line* is an all pervasive one in Western society, and statements suggesting that if nature wants to continue to exist it must pay for itself are accepted as common wisdom (e.g. t'Sas Rolfe, 1990). Both science and Nature are subordinated to economics, a situation which must have implications for geography.

Along with the structure, the importance of the DWEP should now become apparent. It is not only that economics is a framework based on a set of assumptions which are in turn based on the fundamental assumption that people are masters of nature, which is itself interesting. More than this it is that operating within the DWEP prescribes certain actions; the increasing layers of assumptions which accumulate around the central axiom of the DWEP bring to the framework ever decreasing paths of action which will be accepted as desirable by a society which accepts the DWEP. By accepting the framework of the DWEP, one accepts that some actions are desirable and others are not. The paradigm is more than an abstract construction, it is active; it gives direction to human actions, and to a significant degree, it demands certain actions from its supporters.

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2 For men it usually is.

IMPLICATIONS OF THE DWEP

The development of modern economics coincided in Europe with the rise of modern science. Not only did the spirit of science provide an essential philosophy for conventional economics, in doing so it tied itself irrevocably to it. The link between science and economics is unbreakable. The scientific achievements of the seventeenth century were so spectacular that its people regarded the centuries which had preceded theirs as benighted and dark. This darkness consisted in being dominated by, firstly, supernatural entities such as gods and their commands, and secondly, by Nature. Thus human will could only be freed and triumphant by breaking free of the supernatural and by learning how to dominate Nature, instead of the reverse. This the new science achieved, rendering supernatural understandings of the workings of Nature obsolete. With scientific explanations available, Nature was conquered. The Enlightenment thus consists in dominating Nature through science, and bending it to the human will (Lee, 1989).

This naturally raises the question of what the human will dictates; what exactly are we supposed to do with this Nature we have conquered? Locke provided the answer; the indefinite accumulation of money as capital and wealth. Thus science is used to subdue Nature to create more wealth. Industrial societies use technology to transform Nature (as natural resources) in to commodities which are saleable in order that profits may be maximized and money accumulated (Lee, 1989).

For Lee (1989) this represents the congruence of three ideas which have come to represent progress and modern life.

> "1. the logic of capital, the essence of which is accumulation and maximization;
>
> 2. the logic of industrialism based on science and its technology which is, by and large, ecologically insensitive; and
>
> 3. the logic of economic thinking which is based on improving efficiency and productivity;"

Lee concludes:

> "So the restless spirit of capital, necessarily seeking more and more profits indefinitely, finds a perfect ally and reflection in a philosophical attitude of dominance and hostility to Nature, generated by the new science and technology" (1989, p. 169).

It is argued that these attitudes and actions towards Nature are a *necessary* outcome of a social system framed in terms of the assumptions of the DWEP. The assumptions of the DWEP create a value system, and in turn create an economic system to carry through the assumptions of that value system. It is thus through the economic system that the implications of the DWEP are most clearly articulated.

In the language of paradigms, anomalies, if left unchecked, become crises for the ruling paradigm. The Dominant Western Environmental Paradigm has a number of anomalies. It appears unable, for example, to incorporate the insights of quantum physics, even though the rational scientific approach is highly regarded by supporters of the DWEP. Quantum theory is thus an anomaly for the paradigm. It is not the only one, and it is certainly not the most obvious one. The economic approach to nature - valuing it only in terms of its utility to people, and seeing it as a commodity to which one has no responsibility has in effect become the operational arm of the DWEP. This has resulted in the appearance of what is often called `the environmental crisis' (e.g. Porritt, 1990), and it is indeed a crisis for the paradigm. The economic approach and its associated value question are major anomalies which supporters of the DWEP are having difficulty dealing with, and thus serve as good examples of the limits of the applicability of the Dominant Western Environmental Paradigm.

Value[3]

Central to the issue of the inadequacies of the DWEP lies the concept of value. It is a philosophical issue, but then most things are if one asks "why?" often enough. Philosophy could be compared to an ocean current - unless one has some point of reference, one is unlikely to notice where one is being carried. But simply because one is unaware of movement does not mean there is none. To refuse to consider philosophical issues because one is not a philosopher would be as foolish as sailors refusing to watch currents because they are not oceanographers.

The question of values arises with monotonous irregularity, and in various guises in the human-nature interface. In 1977 a Canadian government report on a proposed pipeline in the northern Yukon region recommended that no energy corridor be permitted, and instead called for the creation of a national park in the area, something which would afford absolute protection to wilderness and the environment by excluding all industrial activity within it. The park was intended to protect an area vital to the Porcupine caribou herd, as well as snow geese and many other wildlife species. When the report was released, Canadian television sought the opinion of various people on the recommendations. Many misinterpreted the proposal as being a denial of Arctic natural gas to southern Canada. One response, from a wealthy Toronto couple who were asked whether they would be prepared to forgo natural gas for the sake of the caribou, barely concealed their outrage: "It's them or us!" (in Leiss, 1981, 220).

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3 This section draws heavily on the work of the small band of environmental philosophers working in the USA. I would particularly like to thank J. Baird Callicott and Holmes Rolston III for their enthusiastic and voluminous assistance.

While caribou are fairly large and are thus seen as significant, there are similar examples involving butterflies (Rolston, 1987). In one, the Denver Water Board spent some $ 36 600 000 on a decision whether or not to dam the South Platte river in the Two Forks basin, the most expensive Environmental Impact Assessment (EIA) in history. The document was 1300 pages long, yet was rejected by the Environmental Protection Agency (EPA) as inadequate in its mitigation of impacts. Chief among these was whether and how to protect the Pawnee Montane Skipper, a butterfly sub-species found only in the environs of the dam site.

In the second butterfly example, the Bay Checkerspot, a proposed candidate for the endangered species list, was found on a privately owned 200ha landfill outside San Jose. The owners, Waste Management Inc., set aside large areas for the butterfly as permanent reserve, and invested over $1 000 000 in research and preservation efforts. This included reseeding sites so as to make them Bay Checkerspot habitat, and putting up "butterfly crossings" at the landfill. The company finally adopted the Bay Checkerspot as its mascot and logo.

A different approach to the same butterfly was taken by a second nearby business. United Technologies Corporation (UTC), a large defence contractor found the Bay Checkerspot on the peripheries of its 2 200ha site. The company immediately perceived the butterfly as a threat to national security, and suggested that it could interfere with the company's testing and building of Minuteman and Tomahawk missile propulsion systems. As a defence contractor, UTC was well equipped to deal with the butterfly threat. United Technologies Corporation hired a law firm to raise technical challenges that would prevent the species being listed as endangered, elicited statements of concern from the Air Force and Navy, and hired biologists to try to find the butterfly somewhere else, or even to question whether it is a species at all (Wells, *Wall Street Journal*, 1987, in Rolston, 1987). In doing so they appear to miss the point entirely; the issue is more than simply whether the insect has been categorized correctly. An individual is more than just a representative of a species; a butterfly is a flutter-by[4], and the thing in the box with the pin in its back will never flutter by (Knill, 1986).

Caribou and Butterflies have in common at least that they are alive. To take an example involving non-living entities, a recent research project aimed to find `The socio-economic factors leading to estuarine degradation'. An estuary, as the interface of land, sea, and river, is a particularly delicate environment. The question was why people did things which damaged the ecosystem; things like erecting bridges,

4 This is true in more ways than one - the name was originally `flutter-by', but it was reversed somewhere in the tumultuous history of the English language.

stabilizing dunes, draining salt marshes, and putting blocks of town-houses on the waters' edge. Although the social dynamics were generally complicated (e.g. pro-, and anti-development lobbies, long term residents vs newcomers, and so on) the reason for the destruction of the ecosystem seemed to be money. Estuaries attract people; for their scenic beauty, because they are good fishing spots, because they make good places to launch boats, and for a number of other reasons. Where there are people, there are other people trying to make money out of them, and to these individuals, the estuary was the way to do it. It was simply a resource - its value was related to the number of people it attracted each year, and to the amount they spent. If putting a parking lot on the salt marsh (an important, if not particularly scenic ecosystem) would increase the flow of tourists, then one could expect a lobby for such an action. When asked, almost all town councillors[5] were in favour of development. "But what of the estuary?" one might say. "You can't stop development" was the unanimous reply. The human response in rural Africa is the same as it was in suburban Toronto; "It's them or us".

Such a response is an inadequate ethic when compared with the human potential to alter things. As Aldo Leopold (1966) put it:

> "We are remodeling the Alhambra with a steam shovel, and we are proud of our yardage. We shall hardly relinquish the shovel, which after all has many good points, but we are in need of gentler and more objective criteria for its successful use" (p. 263-264).

It has been observed that the conventional symptoms of civilization's maladaptation to nature - resource depletion and pollution - pale in to insignificance compared to the possibility of abrupt and massive species extinction (Callicott, 1988). From 1600 to 1900, the average rate of species extinction was about one every four years. From 1900 to the 1950s it was about one per year, and if present patterns of exploitation persist, the rate of extinction during the 1990s could be over one hundred species per day. By the end of the century, the total loss of species could exceed one million, more than ten percent of the Earth's complement (Myers, 1979). The impact of such massive destruction is unknowable, but what can be said is that there are few imaginable ethical systems which would allow it, the DWEP is one.

There are other examples, both more and less familiar. The clubbing of baby seals elicits great public response, but then seals are alive, particularly helpless, and very cute. What of non-living entities, like mountains, streams, or deserts? Unless there are perceived to be serious environmental impacts (e.g. scenic), no-one is likely

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5 It was particularly illuminating to note that the majority of town councillors had some stake in the growth of the town; e.g. land speculation, a construction company, an hotel. It was equally interesting to see that in many instances these individuals had been residents in the area for less than two years.

to raise too much fuss if a mountain is quarried, or a river diverted or dammed. The tracks left by vehicles can last hundreds of years in deserts, but do they really matter? Generally the answer is that they are not important. This is an interesting answer, because many individuals feel intuitively that such actions do matter (as is evident from the enormous growth of the Green movement internationally), but are unable to express quite how or why they feel so.

The problem is value. What has value, what does not have value, and why. The first thing that must be said about value as it is commonly used is that it is entirely arbitrary. It is an artificial category, invented by humans, to assist them in their interrelations with the world. It would be no more unreasonable or illogical for an individual to say that only blue things have value, than it is to say that only living things have value, or only useful things have value, or only cute things have value. If everyone in the world came to the conclusion that only blue things had value, then it would, by definition, be true. Value, in its common sense, resides in the human mind.

The second thing that must be said about value is that even in its restricted form as it is commonly understood, value is more than financial. In Leopold's example, the question "What good is a woodcock?" can be answered just as correctly by saying its sky dance brings joy to a spring evening, and satisfies a deep human need for variety, grace, and beauty; as by saying it is a good bird to hunt and goes well with toast (Callicott, 1988). To attempt to put a financial value on the woodcock's sky dance might seem ludicrous. But is it? Someone might fence off a reserve, stock it with woodcocks, and charge admission. A simple equation; amount of entrance fee multiplied by the number of visitors over number of birds = value of a woodcock. The next extrapolation might be that woodcocks in cages are more valuable than those in the wild. In fact, if people are unable to see the bird, it could be of no value at all. But are those dances no-one sees entirely without value? Is there some value in simply knowing that there are woodcocks out there? If so, could it be quantified?

Like most of the attitudes in the Dominant Western Environmental Paradigm, this interpretation of value can be traced to the work of a small number of philosophers. One of the cornerstones of this perception was laid by Hume, on foundations of Descartes'. Decartes drew the distinction between subject and object. He separated mind from matter, *Res cognitans* from *Res extensa*. "I think, therefore I am" is one of the pillars on which our world is built, but carries with it an unstated corollary; that which does not think, is not. On to this Hume added his famous separation, fact and value. Because something *is*, he said, does not in itself mean one can assume that it *ought to be*. There is no logical connection (Callicott, 1982).

The implications of this for any environmental ethic are obvious; if one can not derive a value from a fact, then all values are again human (following Descartes), and all facts (everything non-human) without value of their own, any value they acquire must be projected on to them by a human mind. One faces Nature with only human wants and needs as guides to actions. The net result is that two different types of values are created - *intrinsic*: value which exists independently of any valuing consciousness, and which in this case is limited to humans, and *extrinsic:* the value projected *onto* something *by* a valuing consciousness (in this case necessarily a human mind). Extrinsic value thus becomes the value *to* humans of the non-human world.

The realization that this is an artificial and anthropocentric distinction has spawned numerous refinements over the years, refinements which sometimes attempted to extend intrinsic value to other things. What was it, people asked, that was so intrinsically valuable? Was it simply that one was human, or was there more? Philosophers naturally looked for more. Kant, for example, said intrinsic value lay in the capacity to reason; and in so saying he specifically excluded non-humans. He would also have had to exclude non-reasoning humans, such as babies, which was unsatisfactory. Bentham, on the other hand, recognized that the pleasure and pain of animals must be taken into account as much as the human, and suggested that intrinsic value lay in sentience, or the ability to experience pleasure and pain (Taylor, 1986). Bentham's utilitarianism is the more widely applicable extension, but even here the limits are readily apparent. The problem lies in the theoretical approach itself, and it is this that deserves examination. What is required is some value system which grants worth to those things the present system cannot. It is a problem that must be sorted out. The professional philosophers are naturally loath to throw out the entire system as it has been refined over the millennia; after all, Copernicus did not abandon mathematics and his other inheritances from the Ptolomaic system when he found them inadequate. He used them, refined them, and adapted them to create a more satisfactory system of explanation. Be this as it may, a great many people appear to be ready to concede that non-human entities have intrinsic value. Philosophers must legitimate this intuitive feeling.

A second, but no less serious flaw in the present system of value lies in the potential of science, particularly quantum physics, to undermine Descartes' bifurcation. If physics can no longer identify reality (Wilber, 1985), then a value system predicated on such assumptions must be regarded as potentially suspect.

A third problem lies in the application of the value system. For it to work in any meaningful way, it must be able to compare values, and in practise this means reducing them to financial equivalents. If things are not amenable to monetary valuation, they must be given shadow prices, or risk being left out of any debate. This attitude is obviously problematic; it is impractical, and it is arrogant.

A final point is that value should not be seen to be some sort of distilled abstraction. The concept has concrete validity and use. It is, for example, frequently raised in courts of law; particularly corporate cases. What is the value of a clear flowing river? What is the value of fresh air? The Dominant Western Environmental Paradigm remains unable to provide a satisfactory answer.

Conventional Economics and the DWEP

The economic perspective is rooted in the same history discussed previously, and is in effect the active arm of the Dominant Western Environmental Paradigm. This means that the economic approach has the same reliance on excessive rationality, supremacy of masculine values, and domination already discussed, although none of this will be examined further here in order to avoid repetition. The most important point is that the assumptions of economics in its familiar Western form of capitalism are precisely those assumptions of the DWEP; they are the logical extension of the axioms of the DWEP; the questions of the essence of man, the role of man, and the position of man[6], when answered within the DWEP. lead inexorably to what is here called conventional economics, the collection of classical and post-classical economic theory, including Marxist economics.

The one of the more significant beginnings of conventional economic thinking can be found with John Locke, and both in this chapter and the previous one it was noted that Locke saw the human role as accumulating money; ownership as a right, and creation of money (as wealth) as a duty. In doing so he made two contributions to economic thought which have been internalized as necessary presuppositions for the functioning of conventional economics.

Locke's first assumption is that, for all practical purposes, natural resources are unlimited. Given that he lived in a period when exploration and colonization was proceeding apace, this attitude is understandable. In our time, technological and scientific discoveries have replaced geographical ones, and the frontier myth leads to speculation on the possible wealth to be obtained from Antarctica and from outer space. Along with this assumption of abundance, Locke also assumes that the resources are of more or less equal quality, so that no matter how much any individual gathers for themselves; "there was still enough and as good left; and more than the yet unprovided could use" (1967, second treatise, para.33). Locke does not comment on the possibility of non-renewable resources existing, which makes his theory rather awkward.

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6 Again, used here deliberately.

Locke's second premise has been called "the thesis of the ontological substitution of money for low entropic energy and matter" (Lee, 1989, p. 163), which is quite a mouthful, but a crucial insight, and one of the most important elements in the formation of capitalist thought. Locke relies on examples of edible organic things to illustrate his points. One of his points is that food is not a satisfactory kind of capital, since it eventually rots and cannot be stored indefinitely, nor accumulated in a meaningful manner, even though food is undoubtedly necessary for survival. But money, which can be exchanged for food, can be accumulated indefinitely; accumulation is thus emancipated from the limits of Nature. Since money is inexhaustible, everyone can accumulate as much of it as they want. Certainly money predated Locke and capitalism but where in the past it had functioned largely as a medium of exchange, Locke gave it a new function and legitimation as the ontological substitute for natural resources (Lee, 1989). Yet where gold and silver and rotting apples are real objects, money is not. It can exist as promises (such as cheques), or as electronic signals, and its connection to real things has become tenuous. Where in the past the end was wealth, which meant good food, shelter, a pleasant living and working environment, and other real things, this has been replaced by a conception of wealth as money. But where money can be created at will, real things can not. To conflate the two is to confuse one ontological category with another (Lee, 1989). Thus to run a world where the goal is to attempt to maximize wealth as money is to head for an unpleasant end. Acid rain, the ozone hole, and the other manifestations of the `environmental crisis' suggest that the pursuit of money may erode real wealth (Lee, 1989). Certainly money can protect people from some of the `natural hazards', but ultimately this whole system of wealth breaks down when faced, for example, with a problem like Chernobyl. Indeed pursuit of money as wealth may lead people to sacrifice real wealth in terms of quality of life. Many, existing under the myth of human mastery of nature, live in areas of known natural hazard, again in pursuit of `wealth'; one thinks of cities like Tokyo and San Francisco, built on particularly unstable fault lines. Many more must of necessity eat food which is increasingly artificial and increasingly processed, to say nothing of frequently being poisonous to facilitate the maximization of profits on the parts of the producers and distributors. Lee (1989) notes that Western society is the first culture to find food which poses a health risk to be a socially mandated need[7].

Thus at the very beginning and at the very core of Western civilization is the severance of the economic process from natural reality, with Locke as a pivotal figure in the process. Without this severance capitalism as it exists today could not have come about; Locke gave money a new legitimation by incorporating it in to the very heart of

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7 Apart from *fügi*, which is a different kettle of fish.

the process of accumulation. The nature of capitalism, eternally seeking growth and increase, is not compatible with the notion of a finite resource base. It must, for its own existence, be anchored in something equally capable of infinite and indefinite expansion (Lee, 1989).

Economics, as was said earlier, deals to a large degree with the allocation of resources. This is a far from simple task, and has necessitated the creation of a particular perspective, with its own definitions and assumptions. It is a curious world, where for example it can be proved that the world's oil reserves have grown ninefold (in spite of consumption) since 1950 (Randall, 1987). Such a concept appears illogical and counter-intuitive, after all, if people have been using oil for thirty years, how can there be more now than there was in the beginning?

To understand the economic perspective it is necessary to examine carefully concepts such as resources, sustainable development, discount rates, and the growth debate, as they are perceived from the economic viewpoint, because they are revealing of the real attitudes which lie behind the rational veneer. It must also be remembered that there is a less than direct link between business practices and economics; in many ways business practices developed in the absence of theories, simply as ways to deal with the practical issues of the marketplace. Many systems of national accounts (SNAs) have evolved from two logically inconsistent theories, neoclassical microeconomics, and Keynesian macroeconomics (Norgaard, 1989), although this discussion will concentrate on the broad limitations of conventional economics. What is important about this discussion is the reductionism which lies behind it. While, for the process of understanding, it is frequently necessary to abstract objects or ideas from the milieu in which they exist, it is a characteristic of science, and of economics, to tend to forget about the larger milieu and about the artificiality of the abstraction process, and to regard the categories as real entities. Reductionism creates a world view which is by definition abstract.

Resources

> "A *resource* is something that is useful and valuable in the condition in which we find it. In its raw or unmodified state, it may be an input into the process of producing something of value, or it may enter consumption processes directly and thus acquire value... things that are unknown or for which no uses have been found are not resources, as they have no value. Similarly, things that, though useful, are available in such huge amounts relative to demand that they have no value are not resources" (Randall, 1987, p. 12).

It is obvious from this definition that the economic use of the word `resource' is far more limited than the conventional understanding. It is specifically linked to an understanding of value[8], and is by definition not a static term. The resource concept accepts the possibility that changes in information, technology, and relative scarcity could cause something previously without value to become valuable. In addition, the objects of production - the things produced - are not resources themselves, although resources are always involved in the process of production.

Four different types of resources are recognized in economic theory. The category which is of greatest importance is that of *Exhaustible Resources*. These are defined as existing in given stocks, at given locations. They can be consumed, but they cannot be created. An obvious example would be mineral deposits. Central to an understanding of the concept of exhaustible resources are five smaller issues: scarcity, dimensions, exhaustibility, reserves, and exhaustion. It will be simplest to discuss each in turn.

Scarcity is fundamental to the idea of resources; what is not scarce is simply not a resource. What scarcity means is that the amount available is limited with respect to the amount demanded. In economic terms, if something has a price, it must be scarce, because if it were not scarce it would be free. This does, however, presuppose the existence of markets to trade the resource. If no market exists, the resource could be unpriced, but this would not mean it was not scarce. Again depending on functioning markets, a price rise in a good relative to other goods indicates that it has become more scarce.

Resources have dimensions; *quality*, *quantity*, *space*, and *time*. In a given place, at a given time, a resource of particular quality and quantity may have a value which would be different under different circumstances. Much of Finland consists of freshwater lakes. Clean, drinkable water is so abundant it appears to be more a free good than a resource. This is not so in other parts of the world - it is a rare luxury in much of the Third World, and would be beyond price to someone dying of thirst in the middle of the Sahara. Even in Finland, where there are provinces with more water than land, acid rain is affecting water quality, and thus its status as a resource (McCormick, 1990). Scarcity is related to each of the dimensions of a resource.

Exhaustibility is similarly connected. Resources exist in given stocks in given locations. Since in the case of finite resources (e.g. mineral deposits) no more of the resource can be created, the resources can potentially be used up. While this seems self evident, the definition of resources specifically excludes the unknown deposits. Resource use encourages exploration, and discovery may thus add to the resource, potentially increasing the resource faster than it is consumed. The introduction of

8 Value here is limited almost entirely to financial, and for the purpose of clarity in this discussion we will use it in this sense, unless otherwise specified.

recycling processes may similarly turn waste dumps into resources, again adding to the total. In the short term at least, it is thus not unreasonable to have an annual *increase* in resources, even finite ones, notwithstanding a simultaneous increase in consumption.

This leads on to the notion of reserves. Like resources, they are dynamic, and reflect prices, technology, and discovery rates. A reserve is the identified, and economically viable, portion of the total potential resource. A price rise, for example, may increase reserves because known, but previously sub-economic, resources may become economically viable.

Not surprisingly, the concept of resource exhaustion is just as dynamic as those above. Since by definition no more of an exhaustible resource is being created, use must subtract from the stock. Equally unsurprising is the observation that a resource is exhausted when there is none left. Rather more surprising is the news that a resource can be exhausted before this point is reached, and even that a once-exhausted finite resource can, under the right circumstances, become available for further extraction. Again the sleight of hand lies in the definitions: exhaustion is defined as "a state in which the extraction rate falls to zero" (Randall, 1987). Extraction, at least in capitalist societies, depends on the market. If the market price of the resource is sufficiently high to justify the cost of extraction, the resource will be marketed. Should extraction costs rise above what the market will bear, then extraction will cease, and the resource will be exhausted. Should extraction costs later drop, or the market price rise sufficiently, extraction may begin again, and the once-exhausted resource be again available.

It may at this point be useful to highlight some of the fundamental inadequacies of the economic approach. Firstly, it hinges on an obsolete definition of value (as discussed above). Not only is value here completely anthropocentric, but it is primarily monetary[9]. Appended to this framework is the reduction of the world to the status of a collection of resources. In its generally understood English definition, the term is acceptable, although potentially dangerous. *Homo sapiens*, like any other species, requires some things to live and thrive. These may justifiably be referred to as resources, but in using such a term it must be recognized that non-humans may have interests of their own which overlap or even conflict with those of humans. The definition as used in economics makes no provision for this. It also, as was noted earlier, subscribes to a necessarily reductionist and thus artificial perception of the world.

There is a second danger that adheres to a perception of the world through custom-made definitions. "The limits of my language," Wittgenstein once said, "are the

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9 A fuller discussion of the economic concept of value will be found under the critique of Cost Benefit Analysis.

limits of my world". Language is already an imperfect attempt at describing nature. The use of words limits and shapes description, and thus understanding. Words are necessary categories used to help human understanding - to categorize is to fetter, but not to categorize is to advocate anarchy (Olsson, 1980). If the necessity of categorization is accepted, then it must also be accepted that it has limits and inherent dangers. To operate, as economists do, in a world where exhausted resources miraculously become unexhausted by the simple application of money is to view nature through a potentially lethal framework. This is by no means to suggest that the average economist is unable to distinguish between exhaustion and extinction, or between a biological resource and a species, but if people get used to exhausting resources because they know that with enough money these resources will become unexhausted, sooner or later they are going to be wrong.

Having said that, it may be appropriate to examine the other types of resources which exist in conventional economics. There are three; *flow, fund,* and *biological.* The distinction between them rests largely on the characteristics of resources as discussed above.

Flow resources are those which occur in a quality and quantity beyond human control, and which must be used when provided, or otherwise wasted. An example of this would be sunlight or wave energy. Quality and quantity obviously vary with time and location. Storage of a flow resource is not possible, by definition (Randall, 1987). Storage of a flow resource, for example by converting it to electricity, results in the creation of a fund resource. Such a resource can be controlled by people, and can be withdrawn when needed, subject to the obvious restriction that one can not draw more than is stored.

Biological resources include crops, forests, and animal populations. They are characterized as being renewable but destructible, since their capacity for self-regeneration is dependant on human restraint, a feature which has received extensive documentation (e.g. Meyers, 1984; Cassels, 1987; Repetto, 1987). The stock of a biological resource is referred to as its biomass[10]. While it is assumed that the biomass of a species will stabilize automatically at the carrying capacity of its location, this can be altered by human actions, in accord with economic principles. Indeed,

> "There are some cases in which an economically optimal strategy would permit local extinction (for examples,*[sic]* when the growth rate in value of the resource is lower than the rate of interest)" (Randall, 1987, p. 17)[11].

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10 The status of Nature behind this term is apparent in its degrading and technicist nature.

11 Randall does, however, advise against causing global extinction of a species unless the cost of avoiding such a fate proved intolerably high.

IMPLICATIONS OF THE DWEP

This discussion may have served to give the impression that economics is a unified body of thought. To a certain extent this is true, but like Cerberus, having one body does not mean having only one head. Four distinct schools may be identified, each with numerous smaller groups, and each with their own approach to a particular problem. To some extent these are historical traits, and represent differing attitudes over time, but representatives of each group can still be found today, clinging tenaciously to their particular perspective. Randall (1987) distinguishes between the approaches of each school to the question of resource scarcity, and sets each school within its historical perspective.

Classical economics arose in Britain as the early Industrial Revolution was ending. Technological progress was accepted, and the importance of capital to increased production had been realized. By and large, however, industrialization had had little positive effect on the lives of the common people. Famine, child-labour, starvation wages, and unemployment were common. It was the period which saw intellectuals like Dickens and Marx decrying the treatment of the working class. Two of the most famous economists of the time were Ricardo and Malthus, and their main concern was how the rapidly growing population would impinge upon the exploitation of natural resource. Malthus particularly saw population as growing geometrically, while food production could only grow arithmetically, a discussion examined more fully in chapter four. Land, for the classical economist, was taken to mean all the natural resources, like soil, and minerals. Some, such as the physiocrats, saw land as the ultimate limit to growth, particularly during the early stages of the development of the school. Others, notably Ricardo, rejected this and argued that land, and even labour, would respond to capital investment and could as a result be made to produce more. The substitutability of capital for land became a hallmark of the classical school.

The *neoclassical* perspective arose in the more advanced stages of the industrial revolution. Substitutability became the key factor - capital was increasingly important in the production process, and it allowed for mineral resources to be substituted for biological. The idea of progress became accepted doctrine of economics. Colonialism allowed for resource substitution in space, i.e. foreign resources could be used as domestic resources were exhausted, and it also offered a potential source of cheap labour. The Middle class, with its higher standard of living, became increasingly important. Thus for the neoclassical economist both land and labour respond to capital, hence the acceptability of capital as a substitute for `resources'. Contemporary economics can be divided into two schools, which can broadly be conceived of as optimists or pessimists. The optimists are what are called the *Human Capital* perspective. This approach makes a number of assumptions. That prosperity is the norm for citizens of `advanced' countries, and technological progress pervades every arena, from farming to communication. That individual lives have become to all intents and purposes dedicated to acquiring education and training. Indeed, education has been divorced from learning; education is a commodity, a piece of paper which can be traded for a good job; learning is *per se* valueless. Citing the work of T.W.Schultz, a modern economist with a strong neoclassical intellectual background, Randall identifies two fundamental assumptions of this worldview: firstly, even for agriculture, Land is no longer a limiting factor - fertilizers, pesticides, and the other miracles of the age have removed the limits of food production; and secondly, Labour itself responds to investment. In other words, investing in developing "human capital" will increase skills, which will allow continued increases in production and guarantee further technological production. Capital has taken on a vast new meaning. It includes everything created by the act of investment:

> "physical plant, educated human minds and bodies, farms and forests that respond to investment and management, and the technologies embodied in all of these productive facilities" (Randall, 1987, p. 20).

He goes on to say:

> "The point is that investment is considered the only fundamental limitation to the capacity of the human population to support itself on this Earth. Natural-resource limitations, according to this viewpoint, are simply not fundamental. They can be overcome by substituting capital (physical and human) and the technological innovations the capital generates and embodies for limited natural resources"(Randall, 1987, p. 20).

Randall refers to the less optimistic school as the *Contemporary Malthusians*. This is a school with its roots in the environmental crisis and the Arab oil embargo, and accepts that the basic laws of physics are the ultimate limits to opportunities. As such this group should not be thought of as a part of what this dissertation refers to as `conventional economics' in that their assumptions challenge conventional wisdom. The most economically relevant of these laws are the first and second laws of thermodynamics. The first, that energy-matter is neither created nor destroyed, has been adapted into economics as the materials balance concept. It contradicts conventional economic wisdom that goods are consumed, and suggests that they are merely transformed. Waste is thus given a higher economic priority, and the concept of scarcity is broadened to include some limitations of the environment, particularly its capacity to absorb waste.

The second law, entropy, informs that energy-matter in a closed system is continually transformed from a state of higher to lower availability. While this process occurs naturally, it is accelerated by human actions, e.g. burning fossil fuels. Interestingly, even Adam Smith acknowledged that economics was subject to natural law (1961).

It is perhaps significant that Randall suggests the less-than-optimistic view is embraced by the minority of economists. Indeed, the neoclassical framework, in its conventional market-orientation, is still the most common (Goodland and Ledec, 1987) This is more understandable when one considers who actually employs economists - almost entirely governments and business. One of the chief interests of any government is legitimation; a government, once elected, has to justify its presence to the electorate. No government is likely to do so, however, if it continually forecasts doom and gloom, and if it suggests that unbounded personal accumulation is perhaps both unwise and impossible. That is, after all, the American Dream. Faced with two future forecasts, one optimistic, one not, it requires no great insight to predict which one the politician will make public. Similarly no state-employed economist is going to remain state-employed for long if they continually undermine the government's attempts at legitimation. Identical reasoning pertains in business - companies exist for profit, and economists are employed to assist in its maximization, not hinder the process. It is less remarkable that a minority of modern economists take the neo-Malthusian perspective, than that any do at all. Nevertheless, the existence of the school of contemporary Malthusians must be considered something of an anomaly within modern economic thinking, and is presented in this section for that very reason.

Cost Benefit Analysis

The conventional economic method for dealing with projects which are potentially sensitive is to resort to the Cost Benefit Analysis (CBA) technique. This is a formal procedure for resource allocation, and seeks to analyse all relevant costs and benefits of a proposed course of action. It has been defined as:

> "a practical way of assessing the desirability of projects, where it is important to take a long view (in the sense of looking at repercussions in the further as well as the nearer future) and a wide view (in the sense of allowing for side effects of many kinds on persons, industries, regions, etc.), i.e. it implies the enumeration and evaluation of all of the relevant costs and benefits" (Prest and Turvey, 1965, p. 684).

The main principal of CBA is that it is a test for a potential Pareto-improvement. Pareto equilibrium is an important economic concept, and suggests a state where no individual can be made better off without some other person or persons being made worse off. A potential Pareto-improvement is thus a change which could, after compensation, make at least one person better off, and no-one worse off. This is taken to indicate an improvement in economic efficiency of the society, i.e. an increase in the value of the output of the economy for a given amount of resource input. This would be measured by an increase in national income (Randall, 1987). This simplistic assumption, that an increase in national income (for example, GNP) indicates a general increase in the standard of living, has attracted significant criticism (e.g. Redclift, 1987; Adams, 1990; Daly, 1990)

While it is possible for policymakers to evaluate decisions on criteria other than economic efficiency; e.g. political feasibility, national security, or environmental quality, these objectives are considered at best secondary in the formal CBA, assuming it sticks to its neoclassical principals (O'Riordan & Turner, 1983).

In theory there are five identifiable steps to a CBA (Collard, 1972):

1) Draw up a list of alternative projects.

2) List all the social costs (both private and external) as well as the benefits which will be associated with each project.

3) Quantify, in technical terms, the costs and benefits which will be associated with each project.

4) Calculate the money value of the costs and benefits (this will normally be achievable through market valuations, but for goods which have no market value, like clean air, a shadow value will need to be imputed). A project cost is the opportunity cost (value forgone) incurred in using a resource for the project rather than its next best use. For example, damming a river might involve a project cost of the lost opportunity for white-water rafting on that piece of river.

5) Submit the valuations.

Cost Benefit Analysis is thus simply a technique used in the pursuit of economic efficiency. It is fundamentally imbedded within the conventional system, and remains uncritical of the assumptions of this system. This leads to two obvious weaknesses; firstly the question must be asked whether pareto equilibrium is possible in reality, and secondly whether cash is an acceptable substitute for everything.

Discount Rates

The valuation question in the CBA technique is obviously of crucial importance. One of the problems faced by planners is that while they have to make a decision in the short term, the costs and benefits of a proposed project can extend for decades (e.g. a new dam or motorway) or even beyond the foreseeable future (e.g. radioactive waste). In order to make an informed decision in terms of value, discounting has to be introduced. This is based on the assumption that people in general would prefer to receive a given sum of money sooner rather than later. The discount rate measures how much less valuable the future money is, and will give less and less weight to returns the further into the future they are expected to materialise (O'Riordan and Turner, 1983). The final CBA is very sensitive to the discount rate, but ultimately the discount rate must be an arbitrary figure imposed on the CB ratio. There is naturally strong argument as to what this figure should be (since 1967 it has, in the United Kingdom for example, been 8%, 10%, and 5% under the different political climates). In general, projects, particularly long-life ones, look more attractive at lower discount rates.

Cost Benefit Analysis came into its own with the water-project planning of the 1930s in the USA, and since then has been applied in increasingly complex situations. In the early days it was associated with projects where the output was readily amenable to market valuation, e.g. an increased crop yield. Over time this situation has changed somewhat as CBA has been applied to increasingly complex projects (O'Riordan and Turner, 1983). When used in fields like recreation, education, health, or the environment, the outputs are often intangible or localized, and the accuracy and legitimacy of shadow pricing has led to a history of criticism of CBA, and doubts about its validity as a decision-making tool even within economics (e.g. Ackerman, 1974; Self, 1975; Bradford and Fieveson, 1976; Haveman, 1977).

A second problem, also from a conventional economic angle, is that of intergenerational fairness. It may be true that any individual would rather have money now than later, but this is obviously impossible for people who have not yet been born. Using discount rates necessarily de-values their choices. It is also impossible to know the preferences of future generations - they may not even like freeways or dams. Is it then legitimate to use resources now and thus narrow the potential choices of the future? On the other hand, a policy of not foreclosing future options would be very restrictive in itself; very little could be done now that might not have some future repercussions or impinge on future options? Arguments that technology alone will solve the problem of future resources are naive in that they fail to comprehend the fact that technological change is not without its own cost (Pearce, 1977).

> "There can be no avoiding the intergenerational rationing problem. Even allowing for all the potential for

> substitution, technological change, and recycling, there remains the issue of how the `resource base' is to be distributed between generations. Closely linked with this question is the issue of whether economic growth is desirable. For if resources are allocated, let us say, equally between generations up to a certain date - after which a renewable-technology world is foreseen - then this will have implications for economic growth. If some technological change takes place, a distribution policy of equality of resources will permit future generations to secure higher real incomes than the current generations. There may therefore be an argument for biasing resource allocation to the present, although whether that bias should be the same as that which results from the use of positive real discount rates is very questionable.... The neoclassical tradition in economics has always *presumed* that future generations would be better off in light of the larger capital stock they inherit from the previous generation. This has been a reasonable assumption to date, given the historically exponential nature of economic growth, but may no longer be correct...if social costs are shifted forwards in time, reducing the real welfare of future generations...concern for the least well-off *could* bias resource allocation to the future" (Pearce, 1977, p. 366-367).

The difficulty involved in making environmentally sound CBA decisions has lead to the development of Environmental Impact Assessments (EIAs), and more recently in South Africa in an attempt to become more socially sensitive, Integrated Environmental Management (IEM). While these are certainly advances in that they can accord more weight to the `environmental' criteria, they are rooted in the same basic philosophy, and suffer to a large degree from the same weaknesses.

On a more paradigmatic level, the whole concept of CBAs and even IEMs rests on shaky ground. The concepts suffer from the same arbitrary and anthropocentric definition of value discussed previously. In addition, not only do these interpose bureaucracy between human and nature[12] - thus implying and enforcing a separation, but the very existence of a bureaucracy which is by definition national or local, can allow global effects to continue if they are outside the jurisdiction of the relevant authority. The existence of a bureaucracy can provide a false sense of security that someone is `looking after Nature', when in reality it is physically impossible for any organisation to monitor all possible impacts of even one project. Interference by individuals who are not `experts' in anything is discouraged. As David Pearce, himself a Professor at the London School of Economics, said:

> "Traditionally, economists have engaged in both the positive and normative aspects of their science, although

12 This is by no means to imply that such structures are unnecessary under the DWEP. They are flawed, but quite probably a necessary evil. It is, however, the DWEP which makes them necessary.

> all too often they have pretended, more out of ignorance than intended deceit, that economics is in some sense `value free'" (1977, p. 367).

The Growth Debate

The CBA issue is also predicated on a particular stand in the growth debate. A defining feature of conventional economics is the assumption that society is far from its limits. i.e., that it is always both biophysically and ethicosocially desirable for the aggregate product to grow. This arose from the observation that labour and land responded to capital investment, and was simply extrapolated to assume they would always do so. In fact economists have relied on the judgement that a change in economic welfare implies a change in the total welfare, in the same direction if not necessarily to the same degree (Daly, 1987). For the majority of economists and ordinary people living under the dominant western paradigm, growth = development = progress. "Growth literally is an action of developing and producing" (Humphrey & Buttel, 1980, p. 340). Although the idea of progress as inevitable is an artificial one, the development of which was touched on in the previous chapter, it is an all-pervasive part of the Dominant Western Environmental Paradigm. Equating progress with capital growth has become one of the identifying marks of the DWEP. By and large the feeling is that without continual growth, capitalism will crumble and that will be the end of the world as we know it. But as Daly remarks:

> "Neoclassical growth models notwithstanding, there is good evidence that neither the Earth's surface nor the flux of solar energy grows at a rate equal to the rate of interest! In fact, they seem not to grow at all" (1987, p. 323).

This is a very significant point. Growth is, by definition, exponential. An economy is expected to grow by a certain percentage every year. An economy which only grows at say 2% a year would be considered very unhealthy. Yet it would double in size in 35 years. That means a doubling in throughput (which is what the GNP measures) in 35 years. It takes no great leaps of genius or mathematical brilliance to figure out that this cannot continue indefinitely. How can nature be so out of step with economic reality? The limits to growth are the limits of the world and its energy input from the sun. But even if some capitalist industrialists themselves seem to have recognized this - witness, for example the Club of Rome's *Limits to Growth* (Meadows, Randers, & Behrens, 1972) - it seems to have made little impression. A more recent example; the Global 2000 Report to the President, which warned that between 2030 and 2100 the world's population would be close to estimates (by the U.S. National Academy of Science) of the planet's carrying capacity, should now bear on its cover the inscription "Commissioned by Carter, Discarded by Reagan". This is a crucial point, and is what makes the investigation at the scale of cultural paradigms so useful, because it reveals the interconnection of other ideas which lead individuals and groups to continue maintaining their course heedless of voices raised in warning.

While the original focus of the growth debate centred on population growth, this has shifted noticeably in recent years. In 1974 economists were seeing population growth as the foundation of national strength and wealth, a necessary condition or even a cause of technological progress (Beckerman). By 1980 some had noticed that the human capacity to consume was almost unlimited - 6% of the world's population, those in the USA, were consuming 40% of the resources. Countries with declining birthrates often exhibited changing family roles, with more working women, more disposable income, and thus increased demand and increased consumption. This suggested not only that the population was growing, but that even where it was shrinking, consumption was still rising. This raised policy-oriented questions about the consequences of growth for society and `the environment'. For example; Do the supposed benefits of growth, like social mobility, leisure, and the vast array of available goods and services outweigh the costs, like pollution, extinction, and environmental stress? Would technology be able to protect society from the harmful effects of growth? Is concern about energy and material shortages, pollution, conservation, and depletion based on valid scientific data, or is it just privileged groups trying to protect their positions in society? Assuming growth may cause problems, is governmental policy able to cope with them? (Humphrey and Buttel, 1980). In this same paper the authors concluded that they did not foresee any likely change in policy unless the `environmental' situation deteriorated to the point where the state was unable to continue to protect the citizens from the effects.

Although economists have tended to simply conflate growth and development, a distinction between the two has been common for many years in development literature. The notion of development itself has undergone a number of changes over time. During the 1950s and early 1960s there was a tendency to equate economic growth and development, defined as a sustained increase in real per capita gross national income (Conway and Barbier, 1990). Rostow's (1960) highly influential work on development suggested that there was a development path followed by all countries, and that some were simply further along the path than others. Critics soon pointed out that growth did not necessarily "trickle down" from the rich to the poor, and that there was increasing evidence of growing numbers of people below the absolute poverty line in the Third World, as well as increasing disparity of income between rich and poor. Underemployment and unemployment continued to increase rather than decrease in the Third World (Conway and Barbier, 1990). Marxist interpretations suggested articulation of modes of production, as well as a new international division of labour -

that far from helping the Third world develop, the industrialized world was actively exploiting and underdeveloping it.

Within conventional, non-Marxist development thinking this criticism resulted in two shifts. The first, during the late 1960s and early 1970s, emphasized `growth with redistribution'. Although economic growth was still the main objective, the emphasis was now on growth which would improve the standard of living of the poorest income groups. Because of its potential to eliminate malnutrition and hunger, absorb surplus labour, and boost foreign exchange earnings, agriculture was promoted as the priority sector. Export-led growth was pursued, aimed at stimulating the growth of labour-intensive manufacturing and providing foreign markets for commercial agriculture (Conway and Barbier, 1990). This approach failed to deal with the shortcomings of equating growth and development, however, and led to a more radical shift, sparked by a 1976 International Labour Organisation (ILO) call for a "basic needs strategy".

Supporters of the basic needs approach argued that absolute poverty could not be reduced unless the essential needs of the poor - nutrition, health, sanitation, shelter, water, and education - were met, along with the less material needs of security, self-reliance, and cultural identity. Their strategy recognized that growth by itself, whether egalitarian or redistributive, would not guarantee that basic needs would be met. Instead it was suggested that development policies would have to ensure that these needs are met through increased supply of essential goods and services to the poor - direct government intervention rather than a reliance on market forces. It was recognized that this could entail some sacrifice of savings, productive investment, and overall growth (Conway and Barbier, 1990). Instead the objective became a "new kind of economic growth" where basic needs could "be achieved by redistributing resources within the social sectors and by a reorientation of growth, so that the deprived participate" (Stewart, 1985, p. 211).

The publication of *Our Common Future* (World Commission on Environment and Development [WCED], 1987) was symptomatic of the most recent shift in development thinking, a recognition of the importance of sustainability, although this particular attempt seeks sustainability within the existing economic system. Not only are basic needs recognized as important, but it is argued by the WCED that lasting improvement cannot occur in the Third World unless the strategies being proposed and implemented are environmentally and socially sustainable, and that they sustain or even enhance the natural and human resources upon which development depends (WCED, 1987). The idea of sustainable development is more complex than it seems at first, and it will be discussed more fully below.

More recently, very few economists have begun to differentiate between growth and development. The implication here is that limits to growth are being accepted; but even if growth has limits, development might not. Growth is being taken to refer to the

> "quantitative increase in the scale of the physical dimensions of the economy; i.e., the rate of flow of matter and energy through the economy (from the environment as raw materials and back to the environment as waste), and the stock of human bodies and artifacts ... development (means) the qualitative improvement in the structure, design, and composition of physical stocks and flows, that result from greater knowledge, both of technique *and of purpose*" (Daly, 1987, p. 323).

In other words where growth is a quantitative increase in gross physical dimensions, development is a qualitative improvement in non-physical characteristics. This is by no means to suggest that all economists have accepted the notion of limits. Far from it: Randall (1987), after several pages of impressive graphs, tables, and formulae, concludes:

> "The evidence seems to show that resources are, in general, not becoming more scarce" (p. 29).

It is the theoretical linking of economic welfare and total welfare that concerns Daly (1987), particularly when no limits are assumed. But for Daly limits exist, and the nearer they get (largely as a result of economic growth), the less total welfare can be assumed to move in the same direction as economic welfare. He specifically sees the need for some way to define and account for the other forms of welfare which economic growth erodes and inhibits. The economics of an empty world with hungry people in it, which is how it was when conventional economics arose, are very different to the economics of a full world, even if the `advanced' minority are no longer hungry. Daly sees two kinds of limits to growth, each with its own types of welfare losses[13].

Biophysical Limits consist of three interrelated conditions; finitude, entropy, and ecological interdependence. The fact that things are finite would not be completely limiting if things could be recycled, but entropy prevents total recycling. Conversely entropy would not be as limiting if low entropy sources and high entropy sinks were infinite; but they are not. Since economics is a sub-system of the larger ecosystem, creating and maintaining order within the economic is done at the expense of the rest of the system. Finite time is as much a limit as finite space. The energy from the sun may, as far as humans are concerned, be limitless; but it arrives at a certain rate, and

13 This discussion draws heavily on the work of Prof. Herman Daly since he is one of the few economists who has taken seriously (and written extensively on) the economic implications of limits to growth.

there is nothing that can or should be done to alter this rate. In other words while it may be limitless over time, it is strictly rationed at any given moment.

The disorder, in the form of depletion and pollution, that the economic system imposes on the ecosystem interferes with the ecosystem's capacity to support itself, which includes its ability to support economic activity. While this should be presented as a cost of growth, to be measured against the benefits, national measures of economic growth do the opposite. The expenditure which becomes increasingly necessary to protect humans from the loss of natural services (e.g. clean water) is added to the GNP. This in turn is generally accepted as an indication of national welfare. There is no index of national costs (Daly, 1987). He concludes:

> "There is no more "frontier", no more empty continents, no more sources and sinks. There is just the "high frontier" of outer space, which, as far as we know, is more barren than any terrestrial desert and vastly more expensive to get to. The idea that biophysical limits to growth are near as well as real is not just the fabrication of "doomsayers" (p. 327).

Daly has also identified what he feels are the four most important *Ethicosocial* limits to growth. Two of them, Draw-down and Take-over (Catton, 1982) will only be introduced sketchily here. The other two, the Self-Cancelling Effect of Aggregate Growth and the Depletion of Moral Capital, will be examined in more detail.

Draw-down refers to the use of geological or ecological capital which, if consumed now, will be unavailable to future generations. Since future generations are unable to bid for the rights to use resources, the present market must undervalue them (because of less competition being present than really exists). While accepting that basic needs of the present generation must take precedence over basic needs of the future (otherwise there will not be a future generation), the problem still exists in the consumption of all goods not absolutely basic to survival, and even in the production of these goods. Obligation to future generations is a moral limit to the rate of draw-down.

Take-over is literally what it says. Economic growth requires space for artifacts and people, but other species also require their space. In his discussion Daly limits himself to Bentham's utilitarian perception of intrinsic value, as discussed earlier (in this, sentience, or the ability to feel pain and pleasure, is an indication of intrinsic value). This is a justifiable position, since it was Bentham's utilitarianism which was adopted by economics. While noting this limitation, Daly's argument remains valid. Assuming intrinsic value in other, non-human, things (Daly refers to sub-human species), is there not some moral restraint to taking over their place in the sun? Since it has adopted Benthamic values, even Classical economics must accept the existence of such a limit, even if only because those are the values within which the science has chosen to operate. They are, by definition, its values.

The *Self-Cancelling Effects of Aggregate Growth* were noted in 1974 (Easterlin). The association between self-rated happiness and income revealed something of a paradox, and threatened to undermine to conventional economic assumption that aggregate growth increases social welfare. As was expected, it was found that in a given country at a given time, there is a positive correlation between income and happiness - more rich people rated themselves as `very happy' than did poor people. When checked across different countries with different incomes, however, this correlation did not appear. People in richer countries were not happier than people in poorer countries. Similarly, people in countries which were developing fast did not rate themselves as getting happier, even when the average national income rose dramatically. There are three possible explanations. Firstly there is the suggestion that it is not absolute wealth, but relative wealth, which people equate with happiness. As J.S. Mill said, "Men do not desire to be rich, but to be richer than other men" (in Daly, 1987, 330). This answer to the paradox raises an obvious question. Why then grow beyond a level of satisfying absolute needs, expending energy attempting to satisfy relative, peripheral, and transient desires? Secondly there is the suggestion that it is income change, not income level, which determines happiness. One gets accustomed to living at a certain income level, and it soon becomes routine. A positive change brings a broadening of opportunities, and a temporary increase in happiness, a negative change does the opposite. Since more wealthy people are likely to have experienced positive changes in income, they tend to categorize themselves as happier. What this implies is that we have to grow faster to be happier, and have to keep on growing just to stay in the same place (Abramowitz, 1979). The third factor is that as increased productivity of labour time means an hour of time is worth more in terms of goods, time itself gets more expensive in terms of goods. An oversupply of goods thus means a underavailability of time for other activities; goods-rich and time-poor. It is similarly possible that satisfaction derived from work has become less positive as work has become more routine and meaningless.

Whatever the explanation, the implications for economics are serious. It would appear that growth is less important for human welfare than is generally supposed. Other goals should therefore be seen as increasingly important, and allowed to rise on a relative scale of priorities (Daly, 1987).

The Depletion of Moral Capital as a Limit to Growth. It has been argued that conventional economics was conceived on an implicit assumption that a certain minimum morality, necessary for the functioning of the market, was available as a ubiquitous free good (Hirsh, 1976). In the period of Adam Smith, this could more or less be safely assumed; through shared morals, religion, custom, and education which created built-in restraints on individuals. The problem is that while morality is necessary for growth, growth simultaneously undermines morality.

This undermining occurs on both the supply and demand side of the market. A growth economy must sell to grow - the idea that something should not be bought "because it is frivolous, degrading, tawdry, or immoral is subversive to the growth imperative" (Daly, 1987, 333). The glorification of self-interest and the pursuit of infinite wants weakens the moral distinction between luxury and necessity. Any morality constraining a purchase is inconvenient to the growth economy.

> "the elevation of the deterministic, materialistic, mechanistic, and reductionist research program of science to the status of an ultimate World View. Undeniably the methodological approach of scientific materialism has led to great increases in our technological prowess. Its practical success argues for its promotion from working hypothesis or research program to World View. But a World View of scientific materialism leaves no room for purpose, for good and evil, for better and worse states of the world. It erodes morality in general and moral restraint in economic life in particular. As its power has increased, purpose has shrunk" (Daly, 1987, p. 333-334).

The concern is that scientific reductionism will reduce morality to a series of `environmentally' induced random choices and mutations. Should this happen, morality itself will have "as much authority as the Easter Bunny" (Daly, 1987, 334). Even if science were capable of overcoming all biophysical limits, which it is not, its use as a worldview shatters any concept of a higher, transcendent value system, and simultaneously undercuts the basis of social cohesion presupposed by a market economy. If internal restraint is eroded, police power must be substituted, drawing on other resources to patch up the eroded values (Daly, 1987). It is thus not surprising that private police forces and security companies are among the fasted growing industry in the Western world, and prison officials in the USA have commented that if present trends continue, half the population of the USA will be behind bars within 20 years. The moral deterioration is more than just an increase in crime, it is also the amoral accumulation by some at the expense of others, and their subsequent resort to violence to defend their gains. Growth would thus in the end erode personal freedom, and must therefore be said to actually run counter to development, a point which will be expanded on in the last chapter.

Proponents of eternal growth frequently dispute the finitude of the planetary resource base, but inevitably do so only on a basis of the ability to supply basic human physical requirements (e.g. Randall, 1987). This is inadequate, not only from the perspective that basic human requirements are more than purely physical; there is a significant metaphysical component to human well being, but also from an ethical point of view. Just how much of the planet can humans legitimately destroy in their own interests? Yet in spite of all this, evidence presented thus far suggests that, like most forms of economic investment, simple increase in growth may also be subject to the law of diminishing returns. In addition ecological evidence suggests that the ecological stability of the planet, including the constitution of the atmosphere as a breathable gas, the existence of rain, and even the maintenance of bearable temperatures may be a result of the presence of life on the planet (e.g. Lovelock, 1982, 1990). Human existence, to say nothing of well-being, is dependent on the existence of other life on Earth.

Sustainable Development within Neoclassical Economics[14]

Sustainable development is frequently touted as a panacea for the ills of conventional economics. All too often this is done without a critical appraisal of the concept and its implications, and it is frequently done without a conceptual disengagement of development from growth. This is an untenable conflation, because it implies the potential for sustainable growth, which is very definitely not what sustainable development means (Redclift, 1987, 1988; Adams, 1990; Daly, 1990). Indeed there is some doubt whether sustainable development really means anything at all; O'Riordan has called it "the refuge of the environmentally perplexed" (1989, p. 93). Nevertheless, it is within the framework of conventional economics that sustainable development is most commonly articulated, and it is this interpretation of the concept which must be examined.

Sustainable development is a term in common use, but is a term which is less commonly defined. Within the context of economics, as one might expect, it has a quite specific interpretation:

> "a pattern of social and structural economic transformations (i.e., `development') which optimizes the economic and other societal benefits available in the present, without jeopardizing the likely potential for similar benefits in the future" (Goodland & Ledec, 1987, p. 36).

Even this definition is unacceptable to many economists, and the notions of `sustainability' and `sufficiency' have been banished from modern Growth Economics on the grounds that they overlap and are not amenable to precise analytical definition (Daly, 1987). In other words the concept of sustainable development is not recognized

14 Neoclassical economics is used here as the example of perceptions within the DWEP because of its heavy use by international development agencies, the World Bank, governments, and other development planners (Goodland & Ledec, 1987).

within Growth Economics. Since sustainable development is often articulated as one of the most radical approaches within conventional economics, however, it is presumed here that the notion exists, at least for some.

One of the primary goals of sustainable development is to achieve a reasonable and equitably distributed level of economic well-being which can be perpetuated for the foreseeable future. This would seem to indicate a move away from economic growth based on the depletion of non-renewable resources towards progress based on more renewable resources. Five major implications for economic development theory and practice can be identified (Goodland and Ledec, 1987).

1) Since human well-being depends on at least three categories of value (economic efficiency, equitable distribution of economic resources, and `non-economic' values - for example religious and spiritual concerns, human dignity and pride, aesthetics, and civil liberties), it makes sense for development to attempt to optimize among the values, rather than maximize any one.

2) Accepting the difficulty of predicting needs and desires of future generations, it remains prudent to assume that their natural resource requirements will not be much lower than ours. This implies that natural resources should be used in a manner which does not diminish their usefulness to future generations. Resources should be harvested on a sustainable yield basis, not over-exploited to extinction.

3) Non-renewable resources, such as minerals, should be used in a manner which will not preclude access to them by future generations. This includes the idea of recycling, rather than simply dumping.

4) Sustainable development has implications for energy consumption. Non-renewable energy resources must be depleted at a rate slow enough to ensure "the high probability of an orderly societal transition to renewable energy sources (including solar, wood and other biomass, wind, hydroelectric and other water-based sources) when non-renewable energy becomes substantially more costly" (Goodland and Ledec, 1987, p. 37). This implies the use of long-term planning, rather than short-term market forces, to guide the transition to renewable energy sources.

5) Agriculture and other biological sustainability requires the permanent maintenance of biological productivity on site, where the cost of imported energy and nutrients does not exceed the commercial value of the crop. Damage to the biological productivity of the site necessarily impairs the potential for sustainability.

What must be appreciated is that these principles, while generally justifiable under conventional economics, are quite revolutionary for the field. In general, conventional economics simply does not promote sustainable development even as defined here. For example, the `optimum' neoclassical Management plan for resources which renew slowly, like whales and hardwoods, could well be to liquidate the harvestable resource completely, and then invest the profits elsewhere in some more lucrative enterprise (Lecomber, 1979). Since minimum breeding populations are frequently unknown, this depletion often leads to extinction of species. In spite of evidence that indicates productivity of forests, fisheries, croplands, and other renewable natural resource bases is declining worldwide (e.g. WRI & HED, 1986; WCED, 1987), conventional economic theory typically assumes there are no limits to growth in the physical scale of production and consumption. In fact even the theoretical possibility of the existence of such limits is flatly denied by many neoclassical economists (Goodland and Ledec, 1987), which is hardly surprising since neoclassical economic theory is based on the assumption that land will respond to capital investment.

None of this bodes well for sustainability. It must be remembered that the separation of growth from development is not accepted economic wisdom, and is only the suggestion of a few individuals - however reasonable it may appear it is an idea which will have to swim against the tide of disciplinary inertia, and more importantly, against the inertia of the DWEP. A failure to separate the two, however, illuminates Redclift's (1987) assertion that sustainable development is a contradiction in terms, and Daly's (1990) comment that sustainable growth is an impossibility theorem. If development is equated with growth, then all the limits to growth discussed above return with avengance. If growth has limits, how can it possibly be sustainable? Nevertheless, it is within a conventional *Development=Growth* context that sustainable development has emerged and is most frequently discussed, and it is within this context that it must be examined. Indeed, it may well prove impossible to separate development from growth in the immediate future, given that the populations of the majority of nations are still growing. This does not, however, make them the same thing. For Daly,

> "When something grows, it gets bigger. When something develops, it gets different. The earth's ecosystem develops (evolves), but does not grow. It's subsystem, the economy, must eventually stop growing, but can continue to develop" (1990, p. 45).

It would thus appear that as a term, `development' is interpreted within the constraints and assumptions of either the DWEP or the Green Paradigm, resulting in two very different concepts. This obviously has significant implications for sustainable development. Changing attitudes to development theory have already been discussed under the growth debate, but the actual interpretation of development was not articulated. Defining development is a political act, a semantic and moral minefield

(Goulet, 1971). The general assumption appears in a number of guises and refinements, but suggests that if poverty, inequality, and unemployment are being reduced without a loss of self-reliance, then development is taking place (Seers, 1977; Mabogunje, 1980; Forbes, 1984). As a term, development is an ideal victim for paradigmatic interpretation. It is sufficiently empty that it can be filled at will by different users with different meanings and intentions (Adams, 1990); it is "a Trojan Horse of a word" (Frank, 1987, p. 213). The interpretation of `development' so as to fit the assumptions of the DWEP has a history dating to the rise of mercantilism and economic liberalism, and was shaped to a significant extent by the experience of colonialism (Brookfield, 1975; Adams, 1990).

Within the DWEP development is interpreted to be the process that recreates the industrial world; industrialized, urbanized, and generally capitalist. It is often seen as a crucible or furnace, through which societies pass, and out of which successful societies emerge purified, both modern and affluent (Goulet, 1971). This perspective dominates development thinking, both within and without the Third World (Adams, 1990). Yet it is capitalist and eurocentric, a "developmentalism" (Aseniero, 1985) which suggests that all countries followed a linear path towards development, and that progress can be measured in terms of growth of the economy, or a similar economic abstraction (Chilcote, 1984). Development in the Third World has meant projects and policies, infrastructure and flows of capital, the transfers of technology intended to allow the Third World to imitate the First. "It was the imposition of the established world order on the newly independent periphery (Adams, 1990, p. 5).

Many[15] would be quick to point out that the earlier discussion on the limits to growth neglected the very important issue of the context of development. "Theory is good," as Charcot once said to Sigmund Freud, "but it doesn't stop things from existing" (Craib, 1984, p. v). What must be examined is the situation as it stands at present, and the implications this has for any sort of sustainability.

Three factors affect the sustainability of a nation; its patterns and methods of land use, the changing pressure from an increasing (or decreasing) population, and its position in terms of the global economy. This last factor is perhaps the most crucial, and yet is frequently left out of the discussion.

In terms of agro-ecosystems, sustainability refers to the ability of a system to maintain productivity in the face of a major disturbance - soil erosion, drought, a new pest, or farmer indebtedness, for example. Loss of sustainability becomes evident

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15 For a more in-depth discussion on the limits of sustainable development, see his *Sustainable Development: exploring the contradictions*. I would also like to thank Dr. Redclift for his assistance with this dissertation.

through a decline in productivity (also shown by an increase in energy input required to maintain a level of production) or by the sudden collapse of the system under stress (Conway, 1985). A progressive increase in energy consumption has been an historical associate of economic growth, and this is equally true in agriculture. While this has allowed increased production from limited land, the drop in efficiency of energy usage is startling, and hints at the loss of fertility (and thus sustainability) of the soil. In Spain, for example,

> "Not counting solar energy, the energy input into agriculture has increased more than production. While in 1950-51 one calorie of `modern' [i.e. fuel, fertilizer, etc] energy would help `produce' six calories of vegetable production, the ratio would be in the late 1970s down to one calorie per calorie" (Martinez-Alier, 1985, p. 26).

Indeed, in terms of the energy efficiency of agriculture - energy output divided by energy input - African Pastoralism and Mexican traditional fallow and crop rotation; systems frequently disparaged as inefficient in terms of production per unit area, both display high returns. In contrast to their efficiencies of 9.6 & 10.1, respectively, wheat production in the USA scores an efficiency of 1.7, and spinach a dismal 0.23 (UNEP/CEPAL in Redclift, 1987). These figures must lead one to question the desirability and inevitability of agricultural `modernization'. Not only does such `modernization' necessitate an increase in petroleum-product imports, themselves both unsustainable and expensive, but the energy-intensive nature of such agriculture places it beyond the reach of most rural inhabitants. This, in itself, renders them vulnerable to bankruptcy and ultimately takeover by industrial agriculture - agribusiness. As Redclift (1987) says:

> "For the less developed countries one of the most potent arguments against using more oil-based energy is that, apart from its financial cost and its ecological effects, such energy feeds technological practices that make agriculture less - rather than more - energy efficient" (p. 29).

While it is not a limiting factor in terms of resource consumption, population is vitally important in regard to agricultural sustainability. Oil-based agriculture may be unsustainable and inefficient in relation to energy consumption, but it is efficient, at present, in production per unit area. It is high-input, high-output, where traditional systems are low-input, low-output. With the bulk of population pressure occurring in regions of low-input farming, Redclift sees little likelihoods of sustainable development being achieved within the present context. He predicts that by the year 2000 at least 30 of the 51 African nations will not be able to feed their populations with low inputs; in fact the projected population of 477 million will be 50% in excess of the land's carrying capacity (1987).

This is without adding the effects of ecological damage to sustainability. Global topsoil loss is estimated at 22.7 billion tons per annum. What this means is that by 2000, there will be one third less topsoil per person than at present, suggesting that even countries which have managed to achieve food self-sufficiency at present may not be able to maintain it (Redclift, 1987). For there to be any sort of sustainability, `environmental security' must be seen as more important even than `food security' (Meyers, 1985). Redclift suggests that the pursuit of `food security' in the North has led to the creation of structures which impair food self-sufficiency in the South, and simultaneously the lack of ecological security in the South represents a threat to the food security of the North. He concludes:

> "Until we are prepared to define sustainability in ways that take stock of both the external threat from food policies in the North and the internal threat from demographic pressure in the South, it will remain something of a chimera"(1987, p. 32).

While the existence of international trade has been essential to the economic growth of less developed countries, it has simultaneously ensured that natural resources are exploited for short-term profit. Changes in the economic situation thus have direct effects on Nature; deteriorating terms of trade for poor countries helped push them to clear forests to allow stock-raising. A fall in price for key commodity (cash) crops generally increases the land used for these, at the expense of food crops, sometimes forcing a country to import food when they could well be self-sufficient. Ecological problems may not be reducible to international economic relations, but they would never have become as serious as they are at present if developing countries had been allowed to practice the sustainable-resource methods which often formed part of their traditional cultures (Redclift, 1987).

Conventional economics typically assumes that the `gains from trade' will outweigh the losses. For Redclift this is a naive approach which ignores several serious issues.

1) The gains are quite likely to be unevenly divided between countries or trading blocks, depending on the economic muscle of the participants.

2) While neoclassical theory acknowledges that there will be losers as well as winners, it is powerless to address the issue of global inequality. The theory conveniently assumes that things will balance out between countries. This has not happened.

3) Economic interpretations of development generally assume that growth is broadly beneficial, and that freer trade will stimulate growth. The assertion that growth is beneficial to societies as wholes is open to question. Similarly, until economics is

able to work out the costs of social and ecological decay, pursuing economic growth may be a mistake. For example, the World Bank's policy of lending to high growth sectors has often resulted in social and economic disaster.

As a concept, sustainable development has been the subject of much debate, but has been accepted as a nominal goal by significant members of the development arena (e.g. Bruntland, 1987; Hopper, 1988). The definition favoured by Bruntland in *Our Common Future* is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (1987, p. 43), and this has become the most popular interpretation (Adams, 1990). Adams (1990) comments, however, that it is a better slogan than a basis for theory, and along with terms like "ecodevelopment" it adds little to the debate beyond verbiage. The jargon is very powerful, and is used by everyone, from environmentalists who have no concept of development or political economy, to development bureaucrats looking for a term which suggests radical reform without actually committing anyone to any sort of action (Adams, 1990). Redclift commented that sustainable development "seems assured of a place in the litany of development truisms" (1987, p. 3), and O'Riordan remarked "developers now realize that under the guise of sustainability almost any environmentally sensitive programme can be established" (1988, p. 31).

Summarizing the economic anomalies

It is important to recognize that economists have long appreciated the inconsistencies with which the system of national accounts treats the values of natural systems and products. It is recognized as problematic that under the current system the Gross National Product increases both when resources are depleted, and when more expenditure is required to extract lower grade resources. Similarly it is problematic that GNP increases when the environment is degraded by pollution, as well as when money is spent on pollution control and clean-up (Norgaard, 1989); the Exxon Valdez tanker disaster in Alaska, for example, added over US$ 2 billion to the GNP of the USA. It is suggested that there are three problems which face environmental economics if it is to be realistically applied.

Firstly, it is not possible to simply extend the present system of national accounts (SNA) to include `environmental' information. Although this dissertation has concentrated to a large degree on the theoretical inadequacies of neoclassical economics, SNAs in practice evolved from two logically inconsistent theories, neoclassical microeconomics, and Keynesian macroeconomics. The inconsistencies between these two, their own inadequacies notwithstanding, were overcome through a series of `conventions' reached within economics. These conventions do not remove the logical contradictions which exist between the two, and which prevent a rational expansion of the SNAs (Norgaard, 1989).

Secondly, there is no agreement on the assessment of social values. Market values provide an inadequate scale of relative importance, given the whole problem of assigning values as previously discussed. If present measures are used in an attempt to redesign institutions so as to account for `environmental' values, the replacement `environmental' indicators will necessarily incorporate the failings of those institutions being corrected.

Thirdly, the whole notion of using some system of measures in order to improve the human-nature interface assumes that it is possible to foresee the consequences of alternative interactions and to pick the more appropriate path. These are sweeping assumptions and are not supported by any evidence. In addition, not only is disciplinary information incomplete, but the process of interdisciplinary synthesis is noticeably undeveloped. Not only are the indicators absent, but the models of `environmental'/economic interaction which are necessary in order to predict any distance into the future are similarly missing.

Marxist Economics

The position of Marxism within this debate is a difficult one. As a tool of social analysis intended to redress social inequalities, Marxism does not belong wholeheartedly within the DWEP. As an economic model, its position is less favourable; Marxist economics falls squarely within classical economic theory and in many ways belongs in the previous section on conventional economics. Since it is usually regarded as an alternative to `conventional' economics it is useful to examine it as such. It is necessary to make this distinction, because all sorts of strange things happen if one does not. The most common example of these strange things is the assumption that socialism is Marxism, and is concerned primarily with equality in society. This implies that `environmentalism' is concerned with protection of natural resources, and the usual line of argument runs that while there are problems linking the two, there is no reason why in the long run some accommodation should not be reached. The difficulty with this approach is that it takes for granted the distinction between human and nature; indeed it places society in a position of complete supremacy. With that as an assumption, and the assumption that an equal society is more desirable than an unequal society, the necessary outcome of a debate thus structured is that a more `environmentally' benign way of exploiting natural resources will solve all the problems. Just as capitalism has not examined the implications of its axioms, neither have most Marxists. This is particularly apparent in contemporary South African politics, where we probably have more practicing Marxists than anywhere else in the Western world. Marxist politicians are concerned with social inequalities; indeed they are arrogantly concerned - everything else will simply have to be rearranged to allow this inequality to be reversed. Certainly no-one can argue that inequalities need addressing, but this dissertation argues the way to address them is to examine the axioms which have created society, not take that society as given.

Marxism, as an economic theory, sees a socialist society evolving from the collapse of a capitalist one. The difference between the two is essentially a question of equality in society. Stretton (1976, p. 2), for example, distinguishes between capitalist and socialist by saying "`Right' means wanting present or greater inequalities, `Left' means wanting to reduce them". Since he makes these rather value-laden judgments even before he gets to the introduction, it is quite easy to guess his conclusion. Certainly there is an awareness that the issues are more complex than they have been in the past, and that some of the Left's ideas are in need of an overhaul, or are redundant. But in the end the essence of the argument is that questions of resource use "like any other questions of distributive justice" and that "To be effective - to be put into operation - a program of environmental reform has to be a part of a program of more general social change" (Stretton, 1976, p. 4-5).

Sandbach (1980), on the other hand, notes the difference between Marxist analysis and Marxist economics, but still the question of society is paramount, noting Marx's reference to the social character of technology, and the possibilities of technology transforming social relations. Certainly as an analytical tool Marxism is a powerful one, and Sandbach points out analyses of the military-industrial base on which capitalism rests. The argument does not go far enough. When pushed for a model of a new system, there is a tendency to opt out by listing utopian or alternative futures (e.g. Sandbach, 1980; Johnston, 1991), which suggests that no one is terribly sure what happens next. Sandbach cites China as an example of technology and nature under socialism, and uses the Marxist account to explain regional shortages, denying the existence of Malthusian, or real, shortages. He argues that from a Marxist political economy position true progress can be made towards a healthier environment for all when planning, technological choice, and economic development come under the control of the workers and the local community. Indeed:

> "Food, shelter, energy and mineral resources would be regarded as precious and not squandered as occurs today under the distortions of a market economy. Safety at work and a pollution-free environment would become of elevated importance....Individuals would become feer to travel with improved public transport, cycling and pedestrian conditions, and the wastage from half-empty cars would be avoided" (Sandbach, 1980, p. 221).

What Redclift (1989) called the Promethian spirit of the nineteenth century, lives on. Yet while it is nice to know that a Marxist future envisages cycle tracks, even Sandbach is not convinced of its inevitability. Indeed one of the difficulties with the writings of Marx and Engels is that there is so much of it. Like the Bible, it is possible to find quotations to support numerous (and often conflicting) different points of view, particularly where one is looking for opinions on subjects about which the two were only peripherally concerned. It is therefore not terribly useful to worry about whether the nominally socialist states of Eastern Europe were or were not true reflections of Marx's thinkings. What is more important is to see if the main themes of Marx were reflected in these economies, and even more so, to expose similarities with their ostensible rival, capitalism[16].

There is no doubt that Marx was completely opposed to the capitalist relations of production and their unequal relationship between capital and labour. Yet at the same time, he admired the ability of capitalism to produce goods. The problem, for Marx, lay not in the production itself, but in capitalism's ability to expand its productive capacities combined with its inability to ensure that they are produced to fulfill human needs rather than maximize profit (Lee, 1989). The natural answer to this crisis of capital is then the creation of a social arrangement which can retain the productive abilities of capital while dealing with the distributive questions (Stretton, 1976; Sandbach, 1980).

Marx was as much a product of his environment as anyone else, and his environment was that of the Enlightenment. For him as much as for the others of his period, progress consisted in abolishing superstition through a scientific understanding of the universe. Once this scientific understanding was achieved people would be able to control and dominate Nature to serve human ends (Lee, 1989). Certainly there are large sections of Marx's writings where he recognizes that people are a part of Nature, that Nature is man's (sic) inorganic body (Marx, 1844). Yet he shies away from taking this approach to its logical conclusion, suggesting instead that in the process of the self-realization of the individual, a process of liberation which entails the individual regaining control of their lives and labour, necessitates a subordination of nature, and its transformation by science.

Certainly Marx was aware of the threat of alienation posed by industrial activity, but his concern was chiefly around the threat technology poses to people, not the threat it poses to non-human nature. Indeed where confronted with the ecological

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16 This section draws heavily on the work of Lee, who has presented the most complete analysis of the ecological implications of Marxism I've yet seen.

impact of the Industrial Revolution, he is content to blame the mess on capitalist legal relations of production, not on industrialization itself (Lee, 1989).

> "Capitalist production... disturbs the circulation of matter between man and the soil, i.e., prevents the return to the soil of its elements consumed by man in the form of food and clothing; it therefore violates the conditions necessary to the lasting fertility of the soil....Moreover, all progress in capitalist agriculture is a progress in the art, not only of robbing the labourer, but of robbing the soil: all progress in increasing the fertility of the soil for a given time is progress towards ruining the lasting source of that fertility. The more a country starts its development on the foundation of modern industry, like the United States, for example, the more rapid is the process of destruction! Capitalist production, therefore, develops technology, and the combining together of various process into a social whole, only by sapping the original sources of all wealth - soil and labourer" (Marx, 1967, p. 505).

Perhaps this is all true. The problem is that Marx assumes a change in the ownership of production will solve all these problems. Yet there is no reason why it should. It might reduce the exploitation of the worker, but could easily increase the exploitation of Nature. Marx rejected as utopian a conception of socialism based on environmentally benign production. Lee concludes:

> "By so doing, he seemed to have to thrown his weight behind the standard technology to exploit Nature to serve human needs. In this sense, Lenin's dictum that `Communism equals socialism plus electricity' was what the Bolshevik Revolution was about, is not far off the mark" (1989, p. 185).

Instead Marx, like Locke and others of his era and since, assumed that natural resources were inexhaustible, and that scarcities were as a result of unequal distribution, not as a result of genuine shortages. It was the creative energies of capital which were exploiting the bounties of Nature in a manner which increased inequalities between the classes and ensured that the genuine needs of the working class could not be met. Once this problem was addressed, and the surplus value of the workers was no longer being exploited by capital, science and technology would be able to transform Nature to serve the needs of all. But what were the needs of all? Although Marx distinguished between wants (which are unlimited) and needs, he did not forsee a sufficiency beyond which the growth required to service the needs would become pointless. Indeed Marx and Engels take production to be the essential hallmark of human activity. People

> "begin to distinguish themselves from animals as soon as they begin to produce their means of subsistence, a step which is conditioned by their physical organisation. By producing their means of subsistence men (sic) are

> indirectly producing their actual material life" (1977, p. 42).

Yet in this statement they come very close to implying that hunters and gatherers, by their very nature, are not really proper representatives of humanity (Ingold, 1987). To be human is to progress! And of course that begs the question of what progress is.

Johnston (1991) has pointed out that the goals of the existing socialist states are congruent with those of capitalist states - witness the `space race' of the fifties and sixties. Marx, with the same boundless enthusiasm as his critics, saw human capacities (and thus needs) expanding ever upwards. Yet to service ever expanding needs it is necessary to assume an ever increasing rate of consumption, and thus endless economic growth (Lee, 1989).

This indicates that, far from being a completely different approach to the human-nature interface, Marxism accepts the same fundamental assumptions outlined earlier in this chapter, namely that progress entails 1) the logic of capital, the essence of which is accumulation; 2) the logic of science and technology; and 3) the logic of economic thinking where efficiency is defined as more output for a given input. Since Marx showed no desire to reduce output, and indeed production figures were often used as targets in `socialist' states, closely allied to science and technology in reaching these goals, points 2) and 3) must be accepted. Yet if they are, point 1) must be too, since without 1) there would be no 2) or 3) since the domination of Nature through science and technology requires the accumulation of capital (Lee, 1989), and since it is a fundamental assumption of classical economic theory that land, and for some with neoclassical leanings, even labour, will respond to capital investment.

Lee (1989) argues that, given this situation, the socialist economies which still exist, or which have recently collapsed, must instead be regarded as state capitalism. Even if Marx did not approve of state capitalism, the acceptance of the logic of progress and of the human role in the planetary system necessitated systems which moved towards much the same goal as bourgeois capitalism itself, and which exhibited similar, if not worse, examples of ecological destruction.

Where Marx and Engels flirted briefly with the notion of people as part of, and responsible to, Nature, they did not carry this idea through. Indeed it is more common in earlier writings than later ones, and in terms of space devoted to the question it is really quite a non-starter. To have fully developed the idea would have meant devoting considerable time, effort, and space to the complexities of an environmentally benign social structure. Such writings just do not exist. Engels is at his most emphatic on this point:

> "In short, the animal merely *uses* its environment, and brings about changes in it simply by its presence; man by

> his changes makes it serve his ends, *masters* it. This is the final, essential distinction between man and other animals, and once again it is labour that brings about this distinction" (1934, p. 179-180).

And:

> "The most that the animal can achieve is to *collect*; man *produces*, he prepares the means of life, in the widest sense of the words, without which nature would not have produced. This makes impossible any unqualified transference of the laws of life in animal society to human society" (1934, p. 308).

In the final analysis, Marxism (as an economic system, rather than as an analytical tool) is as much a part of the Dominant Western Environmental paradigm as is bourgeois capitalism. It suffers the same fatal flaw in assuming that `because' humans are masters of Nature, all human needs are rational needs; or at least rational enough to allow them to drive the economy. Many Marxist theorists recognize that needs are socially determined. Yet there is still the assumption that society will rationally decide on appropriate needs. the perspective that the world is a collection of resources awaiting human use, however, brings with it the implicit suggestion that a failure to use the resources would be irrational. With humans as the only measure of value, and with the excessive concentration on assumptions of rationality, combined with the confusion of evolution and development a picture is created which suggests that socially determined wants must be developmental needs.

Capitalism goes even further and assumes that all wants, since they are by definition human wants, must by the same definition be needs. Given that the three largest industries on the planet are Arms, Illegal Drugs, and Petrochemicals, none of which is ecologically friendly or, for that matter, people friendly, this seems a rather dubious assumption.

The Commodification of Science in the DWEP

Science has `proved' that economic man[17] stands at the top of the evolutionary tree. If this is the case, then the human role in life is trade, or in the Marxist variation on the theme, labour; and the office of science is to facilitate this role. Thus where science seeks knowledge[18], it then does so with a specific goal in mind, a goal set by the cultural paradigm within which science operates: it seeks knowledge of Nature that it may better control Nature. With the Neo-Darwinian emphasis on struggle, conflict, and a hostile planet as a part of the DWEP, it is those with the most power who most ably demonstrate their fitness. Thus the quest for power, while arguably psycho-sexual

17 Again used deliberately.
18 The search for knowledge as opposed to understanding or wisdom should be noted as a feature of a science constrained by the DWEP.

in origin, is elevated to a legitimate scientific `truth', and psychologists have even suggested a `need' to dominate one's environment (e.g. White, 1959; Lefcourt, 1973). As a corollary those with less power demonstrate both their lack of fitness and their closeness to nature, and thus are legitimate resources, amenable, with the rest of nature, to exploitation by the powerful, cloaked in its guise of `substitution of capital for land and labour'.

Where science, like bourgeois economics, in the past served as a weapon against feudal aristocracy, and was thus in some ways a liberating force, modern science is a product of modern capitalism. It is founded in the need for capital to not only expand horizontally into new regions, but to transform production, create new products, make production more profitable, and to do this ahead of others who are trying to do the same thing. It is firmly located in the assumptions of the DWEP and the political philosophy of the bourgeois revolution (Levins and Lewontin, 1985).

In *The Communist Manifesto* (1848) Marx and Engels lamented the reduction, by capital, of previously existing bonds into purely financial ones. They noted how previously honoured occupations such as physician, lawyer, priest, poet, or sincerest had been reduced to simple paid labourers. Yet this is exactly how things would appear to have, in theory, been functioning behind the Iron Curtain. More than this, however, is the question of the goals of communist societies. It is readily apparent that the goal was to attain standards of material welfare equivalent to those of capitalist societies, while at the same time attempting to avoid some of the excesses. This is at least in part because communist societies felt compelled to compete with capitalist societies, on the grounds that if they could not offer their citizens the same standards of living, they would be deemed to have failed, which is exactly what happened, and which to a large degree lies behind China's recent liberalization of trade. Only in very few cases, such as Tanzania, was there explicit promotion of lower levels of consumption on the grounds that higher levels were neither necessary nor sustainable. The communists' system sought the same material goals, through a different process, but in general the production goals of the two in terms of what was wanted could be considered very similar (Johnston, 1991). For this reason much of this debate is immediately extrapolable to existing Marxist or communist economic systems[19].

Commodification is an integral part of capitalism, it is legitimized by the substitution of capital for land and labour, and necessitated by the need for expanding production and consumption. The eternal quest for new things to sell has seen entertainment, leisure, emotional support, learning, sport, human organs and blood,

19 If there are any left by now.

and an infinity of other `items' enter the market. It would be very naive to expect science to have remained intact.

Research has become a business investment, competing with other traditional fields for investment such as advertising, lobbying, bribing, or investing in plant. As an investment, research must compete against these other areas on the simple criterion of profit maximization. In its most extreme form this research investment takes the form of the scientific report from a consulting company, such as the thousands now doing environmental consulting. Given the competition between these firms, and the fact that the final product is tested by client satisfaction rather than peer review, as well as the fact that the client requires information which will assist, rather than hinder, profit maximization, a certain lack of critique must be expected. Levins and Lewontin (1985) suggest further that problems such as scientific fraud, appropriation of the work of others, and falsification of results in order to boost success rates are growing problems.

Because a company can now estimate the time and the cost required on average to produce a new product, scientific activity will increasingly be regarded as generalized human labour rather than an approach to problem solving. Similarly, scientists become little more than scientific personnel, with a loss of creativity as a result of increased division of labour. Worse, the fragmentation which results, and which will increase under pressures from capital, mean an alienation from the final product, as well as a loss of responsibility for it. Scientists are thus no longer responsible to their peers, but to their bosses in the hierarchy of control of resources (Levins and Lewontin, 1985). Even granting agencies which support `pure research' find themselves under pressure from industry to sponsor projects which are `relevant' (read useful to the production process) rather than `abstract'[20] (read not directly useful, or worse, critical).

The capital inputs for science have become major industries, including equipment, animals, information, and chemicals. As a result the market pressure exerted by the purveyors of the inputs tend to guide science, rather than the other way around. Journals, once intended to take the place of personal communication between scientists, are now produced by publishing houses which must, by the rationale of the system within which they operate, produce and sell. From our position in Africa, we can simply not afford these glossy publications, any more than we can afford books[21].

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20 It is interesting to note that in spite of the fact that the reductionism characteristic of science under the DWEP leads to an abstract world view, this perspective is held to be *real*, and *abstract* is used as a derogatory term for alternatives or critiques.

21 In spite of the continual increase in the number of journals, UCT, as representative of South African universities, continually reduces the number it buys. Had it not done so last year, the library budget would have had enough left over for the purchase of one (small) new book.

From anyone else's position one must ask how much of what is published really deserves publication and how much is just noise. The same logic applies to shiny new machines. As they get more and more expensive, they place greater stresses on universities, causing the universities to attempt to produce more saleable graduates in the hope of attracting funding from grateful business. Not all universities are successful, with a resulting centralization of technology in some, usually in the First World. Not that Third World countries do not sometimes get the shiny toys, but, as Levins and Lewontin (1985) note, it is easier to found an institute than to keep it going. Third World hospitals and universities are littered with inappropriate, expensive, and often unnecessary or unused machinery bought for political expediency or national prestige in the name of `development' than out of necessity.

More than this, within universities generally the allocation of resources is influenced by the prestige and earning capacities of programmes. As a result scientists often face pressure to move their research in more profitable and applicable directions (Levins and Lewontin, 1985). Similarly universities, instead of being places of research, must produce various grades of scientific labour at the lowest possible cost, or face the sanction of industry. This implies not teaching the student too much, nor letting them take too many `unnecessary' courses; shortening the duration of graduate study, and getting more PhD's for the buck (Levins and Lewontin, 1985). The net result is a steady decline in standards; where in the past a PhD was a major contribution to the field, a *magnum opus*, it is today little more than a specialized qualification. This would suggest that, far from maximizing real development, the real impact of conventional economic practices is to hinder it.

This presents something of a problem for science, and particularly for geography. If the discipline is becoming increasingly commodified, along with the rest of science, what does this mean for its capacity do deal with the `environmental' crisis, when it could be argued that crisis is a facet of the same process of capitalist expansion? Similarly the process of commodification, which is not only a continual search for new products but also for new markets, implies a strong pressure in the direction of the `lowest common denominator'. This is particularly apparent in South Africa at present, where the `need of the masses' for university education is translated into a demand by some for lower standards. The degree is the commodity required, not the learning it represents. The same pressure exists in the First World, it is just better disguised. The lowest common denominator is also often the line of least resistance, leading to the couch potato phenomenon, where people are encouraged to attempt self-actualization simply by doing nothing.

Economics and ecology are totally interconnected in the DWEP, and ecology is subordinate. Worster (1979) has argued that the same society which produced the Great Depression produced the Dust Bowl of the Great Plains, and for similar reasons. The inherent pressures of capitalism on individual farmers to increase their personal wealth through exploitation of nature led them to ignore natural limits, just as Wall Street ignored sharp practices and a top heavy economy. Blaikie (1985) has argued that the attitude of capitalists to resource extraction in the Third World has been akin to slash and burn agriculture; a `mining' of the area for the desired resource, and a rapid move on, with consequent negative social, economic, and natural impacts for the mined region. Indigenous Third World attempts at preservation of nature such as the Rain Forests run up against the full force of the ecological imperialism of capital (Johnston, 1991), and almost inevitably the short term gains of economic activity are accepted against the sacrifice of the long term health of nature (Blaikie, 1989). Third World elites, eager to demonstrate how `developed' they are, and often embarrassed at the possibility of being thought primitive, are enthusiastic partners in the enterprise. The Pygmies of Uganda and the San of Botswana and Namibia, for example, receive little government support even though their lifestyles are under considerable threat.

Capitalist penetration similarly incorporates land previously outside the capitalist world economy, not by force, but by eventually including it in the capitalist circle. Yet this articulation of modes of production almost inevitably results in the peasants being drawn further and further in to the capitalist system, and running up greater and greater debts as they attempt to compete with each other and with agribusiness, until ultimately the peasantry is impoverished, marginalized or proletarianized, and nature degraded through the pressure of the struggle to compete (Johnston, 1991) a process called silent violence by Michael Watts (1983). This structural violence is linked to the core-periphery relations and the international division of labour. Johnston (1991) argues that if the capitalist system produces a relationship where French children have a life expectancy of 78 years, while those in Sierra Leone can only expect to live 40, then structural violence is being perpetrated against the latter.

The link between degradation of Nature and economic systems is well documented (e.g. Blaikie, 1985; O'Riordan, 1989; Johnston, 1991). What is less well documented is the response. If, as has been argued, science is subordinate under the DWEP to economics, then there are two ways for geography to deal with the problem. Geography can remain within the DWEP, and attempt to ameliorate the problems as they arise, or simply ignore them and leave them to Environmental Consultants[22]. Or it can reconceptualize itself outside the DWEP in a position where it can offer a critique,

22 Who, as long as they remain within the DWEP (and who are naturally under pressure to do so), will not be able to deal with the problems.

not just of ecologically insensitive actions, but of the whole ecologically insensitive manner in which Western society has structured its relationship with Nature. It is argued that geography cannot make a meaningful contribution to an examination of the real causes of the crisis form within the DWEP.

Environmental Crises, Geography, and the DWEP: A Conclusion

Close examination of the Dominant Western Environmental Paradigm reveals that is flawed, both in its logic, and more importantly, in its application. Indeed, this dissertation is based not on a rejection of the scientific method or economic principles, but on an articulation of their weaknesses, not least of which is a frequent failure of those using certain principles to actually stick to them. The failure of scientists to evaluate their own biases, or the biases of their method or disciplines parallel the dogged refusal of many businesspeople to accept that a free market system, based on perfect access to information, perfect mobility, and perfect choice is a mythical beast indeed. Many of the roots of the DWEP make provision for some of these shortcomings, but these do not come out in practice. Although never intended as such, the scientific method and economic practice have become vehicles for domination by certain small sectors of society.

The economic issue is more complex than it seems at first glance. The conventional wisdom of economic growth as the panacea for the world's ills is not tenable. Not only is economic growth unsustainable on a finite planet with finite resources, but economic growth has severe impacts on both human and non-human environments. Even if biophysical limits are too far distant to worry about, factors such as Take-over and Draw-down create ethical limits which might be much nearer. The equating of growth and development is no longer justifiable, and in many ways the clinging to Holy Grail of growth is a left-over from a time when population growth was seen as the motor of the economy.

The links between economics and value have become more apparent, and with this has come an awareness that there are some lapses of reason in the Dominant Western Environmental Paradigm. The system of arbitrarily placing value on some things and not others because they fill some human criteria is at the very least illogical. Even the limited interpretation of value acknowledged by neoclassical economics is not fully developed in economic theory, and is generally actively disregarded. This has also allowed the creation of a system which can value the planet only in financial terms. Such an approach is necessarily abstract; it takes into account only some aspects of the whole, and ignores the whole entirely. In doing so it has allowed the proliferation of what are euphemistically called `externalities', to the extent that these externalities threaten the continuation of life on the planet, and are themselves posing challenges to the ruling paradigm.

\`Everyone' knows that a paradigm shift is occurring. This, in itself, has prevented much work being done on alternative paradigms simply because people assume a) that they know what the alternatives are, and b) that it has already been done. Part of the problem is the use of the term; when people talk about paradigm shifts, they naturally assume that since they are using the same words they are talking about the same thing. They need not be.

The question of scale is a vital one. For the sake of this argument a cultural paradigm was taken to be one step below an ideology (although sharing some characteristics with ideology, since an ideology would be composed of cultural paradigms). A paradigm of the scale of Catholicism, or the scientific method was labeled institutional, and it is a combination of institutional paradigms which forms a cultural one. Disciplinary and subdisciplinary paradigms are self explanatory. The DWEP and the Green Paradigm are cultural paradigms which offer interpretations of the appropriate relationship between human and non-human Nature. Both form part of the Western cosmology.

Within a system of any size there must be a degree of flexibility, and thus it is that paradigms can tolerate anomalies up to a point. As a result, while there is a feedback system between paradigms on different scales, they need not necessarily move in the same direction. A move towards a unification of geography around the issue of human-nature relations might be considered by some to be paradigmatic, although others may argue that there has been no revolution and it would simply be a return to the roots of the discipline, if such a unification took place at all. Such a discussion is purely disciplinary or sub-; it may be motivated by an awareness of changes in other paradigms, but it is not consciously linked, and can not be said to be the same thing as a change in the cultural paradigm. Indeed there is no reason why changes on different scales could not be in contradictory directions. Paradigms articulate on one another, on the same scale and on different ones.

This section began by defining the Dominant Western Environmental Paradigm as being a cultural paradigm formed around a particular interpretation of the human-nature interface; namely that humans are superior to nature. This, it was revealed, is closely linked to a definition of human which makes the essence of human-ness the mastery of nature. With this as an axiomatic assumption the role of humans is logically and necessarily to master[23] Nature. The emphasis on human activity in changing or controlling Nature leads inexorably to the question of the production of society, and to

23 The gender associations of this expression should not be overlooked.

the production process itself. With Nature reduced to commodities in the production process, an economic system is necessary to deal with the distribution and exchange of commodities. Thus where it was science which, in the beginning demonstrated not only that *man* had the power to master nature, but which then proved such mastery to be the logical outcome of evolution; in the end science became subordinate to economics. Science's perspective of Nature is therefore of something to be known, that it may be controlled. Conventional economics regards Nature as a commodity. Philosophy regards nature as something non-human and therefore of no value in itself. It is possible to find religious justification for seeing nature as existing solely for human use. All these are facets of the Dominant Western Environmental Paradigm, they are mutually supporting, and combine to give a particular interpretation of Nature which is carried forward as the cultural paradigm.

This creates two roles for science. Firstly, to legitimate the assumption that people are in fact the most important thing on the planet; a role which is taken up by Neo-Darwinism, and which is extended to its extreme by sociobiology. Secondly, to assist in the process of this mastery. While the two roles do not necessarily presuppose one another, they are mutually supporting, and the links, as in the example of the captain of industry reading sociobiology texts, often s: orter than one may imagine.

There is a flip-side to the commodification of Nature, and that is the power hierarchy. With concepts like superiority, mastery, and control as fundamentals in the DWEP's definition of an appropriate relationship with Nature, it is almost inevitable that the notion of superiority should be linked to power as ability to control Nature, and indeed as distance from it. Thus those seen as closer to Nature, or as less powerful, are fair game for use by the more powerful (and thus superior). Ingold (1987) argues that the sociobiological perspective necessitates a view of people as commodities because it regards society as instrumental, and thus other members of society as instruments. Certainly some of the roots of unpleasant isms like Euro-centrism, racism, sexism, and colonialism can be found in these assumptions, although there are undoubtedly other influences too (e.g. Barzun, 1958, Leiss, 1972).

The treatment of animals as mindless automata is a legacy of Descartes, and his dichotomy between mind and body. Yet it is important to recognise that while such a distinction is needed in order for us to function, it is an artificial one. Failure to recognize this has led to the supposition that reality is co-terminous with the rather arbitrary domain of phenomena which can be handled by the methods of natural science. Natural science assumes that an objectified nature is the final arbiter of knowledge; that if it cannot be quantified it is not real. Yet there is no reason to suppose that subjective experience is not real (Ingold, 1987).

THE GREEN PARADIGM

Civilization, as Lee (1989) points out, is necessarily based on the repression of some inclinations and the expression of others; which means the crucial question is which to deny and which to express. Present Western civilization is intimately linked to the DWEP. It celebrates and even encourages selfish inclinations to the point where it denies that people are capable of altruistic ones; it celebrates the pursuit of wealth as money, the possession of goods, the consumption of goods, and the power over other agents possession implies (Lee, 1989).

Congruent with the assumptions of Descartes, Locke, and the other founding fathers of the DWEP are assumptions about the nature of progress, of change, of order, of direction, and of perfectibility. It is not necessary to support all the assumptions of the DWEP to operate within it; paradigms continue to exist in spite of anomalies. Yet the assumptions of the DWEP all point in the same direction, at least in part because they are tautologically defined. If the definition of human is one with mastery over Nature, then the role of humans is not open to debate. If the role of humans is thus defined, then the role of science and society is too. Similarly if people are defined through an ability to produce, then production must be a social and scientific goal. By the same token, if evolutionary theory places *economic man* at the top of the evolutionary tree, then who are economists to argue? It is simply justification that they are right. What this dissertation is not arguing is that the perception of *man* as master of nature leads necessarily to capitalism, and inexorably to ecological collapse. It is more that the progression is a logical one; each refinement and sophistication of attitudes within the DWEP fits logically into the framework. This does not mean they are the only possibilities which could have fitted into the framework - had there been other developments which fitted better, the path could well have been different. Nor does it mean that they were all necessary to the final picture - the extremes of sociobiology, for example, could be left out without significantly altering the course charted by the framework of the DWEP. What it does mean is that once the framework was complete, once the paradigm had sufficient complexity and internal coherence to be accepted by society as appropriate as a cultural paradigm, then the resultant ecological stress was inevitable. Furthermore, that to deal in any meaningful way with this ecological stress, it is necessary to create an alternative framework for analysis.

Many of the assumptions of the DWEP are products of a particular era, one which saw the birth of science and the birth of economics, as well as great improvements in human welfare. It is understandable that they should play an important role in the history of Western thought. But these assumptions have brought with them huge ecological cost. It is less understandable that they are so uncritically accepted hundreds of years later. The more threads in a tapestry the clearer the picture. Based on the original hypothesis of human mastery of Nature are developments in science, in philosophy, and in economics which combine to move society in a certain direction. Geography does not seek to answer Kates' question of what our relationship with nature ought to be because it knows the answer. Geography has not made any meaningful attempt to offer a critique of the assumption that humans are masters of all they survey. At its most radical it has merely disputed ownership of the production process. It has not disputed the process itself.

Science is a social product. While it seeks knowledge, it does so with the aim of fulfilling a task set for it by society. Under the DWEP the task set for science is to facilitate the control and exploitation of Nature. This is by no means to suggest that every single scientific investigation or experiment has domination as its end goal, nor that scientists sit at the end of the day and ask themselves if they have extended human mastery far enough. Rather it is the whole framework within which science operates, and which was outlined in the section on the commodification of science. It is the same logic which sees BA degrees as worth less than BSc degrees, because they are `less useful'. The fact that a BA teaches students to think, to read, to conceptualize ideas, and to appreciate truth and beauty is considered less important than the fact that natural science students are trained to do things; thing which are important to the production process and which are thus saleable. Where a BSc will help you get a job, a BA is more use in understanding life. But perhaps the flip side of this is that it is not in the interests of the production process to have too many people who are capable of seeing the large picture. Which may be why all the directors of Anglo-American[24] have Arts degrees from Oxford, but why the company stresses science and business degrees in its bursary schemes. And why universities internationally are under pressure to produce useable graduates rather than self-fulfilled ones. It could be argued that true development, if it is taken to be the fulfillment of genuine human needs, one of which is to self-actualize (Maslow, 1954), is structurally constrained by the DWEP, and in many ways runs counter to the direction envisaged by the DWEP.

The commodification of science extends to the commodification of geography. As economic processes get larger and larger, and as the population of the planet grows, so the stress between economics and ecology becomes ever more apparent. This human-nature interface has always been a traditional concern of geographers, even if they do forget about it from time to time. Yet it is not geographers who are being called on to deal with the problems. It is specialists like botanists, zoologists, and `environmental scientists'. Now this is certainly a much grander sounding title than `geographer', and it has the magic word `science' in it, so it must be good. Yet the South African experience of environmental scientists has seen what is for some an

24 South Africa's (and probably Africa's) largest Multinational.

uncomfortable alliance between them and the interests of capital. The two chairs of environmental science in the country were sponsored by petrochemical companies. Now one would certainly not suspect these companies of active interference in the research agendas of departments under the chairs, but there is always the possibility that the universities themselves, the holders of the chairs, or members of the departments may feel obliged, or may not wish to jeopardize the possibility of continued or increased funding, and may be a bit less critical than would otherwise be the case. When students at UCT threatened to picket the ceremony at which the Environmental and Geographical Science building was named after Shell (at the suggestion of the university, not of Shell), the university administration was profuse in its apologies to the students, but was chiefly concerned that a demonstration would discourage other potential sponsors from making donations.

On the other side of this coin, people who are professional environmental scientists tend, in South Africa, not to be geographers, but refugees from peripherally aligned *hard* sciences like zoology and botany. Environmental Science in South Africa is thus a sort of bargain-basement geography; geographical techniques without the critique. Although I have for many years tried (unsuccessfully) to find a definition of environmental science which distinguished it from geography, it is possible to obtain, at some South African universities, Masters degrees in Environmental Science, or even doctoral degrees in Environmental and Geographical Science, having never done an undergraduate geography course. Commodified geography is less and less able to deal with the real issues of the day. The roots of the `environmental' crisis are deeply intertwined with the roots of Western society and the present economic order. Yet geography appears to get more and more superficial in its analysis of the crisis. Excessive concentration on techniques like cost-benefit analysis and on toys like GIS leave one with little time or brain-space to debate the appropriateness of the economic system within which the system operates. The essence of commodification is the removal of all the non-saleable (also termed abstract, irrelevant, or wooly by the *hard* scientists) aspects of the discipline, and the concentration on techniques which, since they are saleable, must be beneficial to the production process. The production process is not going to pay money to be told it cannot do things, unless it can be convinced it will save money by not doing them. Critique, in other words, is not saleable on any significant scale. A commodified geography is therefore, almost by definition, a geography powerless to deal with the ecological crisis. A powerless geography is the result of the framing of disciplinary goals and assumptions within the DWEP.

This is the region of environmentalism O'Riordan (1989) calls accommodation. He is scathing of it, seeing it as the safe haven for the cautious and anxious, providing succour for the liberal environmental academics and consultants; the heartland of cost-benefit analysis and the ethically loaded variations on that theme, nourishing the `environmental' impact community within and outside government and industry.

> "Accommodation is the whirlpool of contemporary environmentalism into which much intellectual debris is sucked. It is the preferred position for most middle-ranking executives and administrative officials... the choice of the majority of white-collar unions and the bulk of service professionals... the convenient location for the liberal-socialist group of party politicians anxious to capture the green vote without alienating the establishment... [and] a comfortable arena for the aid and development professionals and advisers who wish to see a Third World sufficiently prosperous as not to drain the aid budget... yet not so prosperous as to threaten trading relationships and northern hemispheric industrial survival" (O'Riordan, 1989, p. 88).

O'Riordan suggests that accommodation is a perspective held by about half the populations of developing countries. This brings us to a point where terminological difficulties are encountered. O'Riordan sees `environmentalism' as a very broad, overarching term which encompasses all kinds of concerns about nature, from interventionism to Gaianism. His terms technocentrism and ecocentrism correspond very roughly to the divisions in this dissertation which are labeled DWEP and Green Paradigm. Although O'Riordan's terms have been around for a long time, and are familiar to most geographers, they have not been used here for two reasons. Firstly, they are useful as vernacular, or jargon terms, but the contrast between ecocentrism and technocentrism can be read to imply that ecocentrics reject technology, where the debate around technology (appropriate or otherwise) is very much a secondary one. Secondly, and more seriously, they are not amenable to terribly precise definition and thus analysis, having been coined after the fact, as it were, to describe existing patterns of thought. This dissertation goes in the other direction, beginning with the assumption and showing how a pattern of social organisation and even a pattern of thought is necessarily a result of that assumption.

The result is that where O'Riordan's eco-techno distinction requires further refinement in to Gaianism, communalism, accommodation, and intervention; this dissertation sees only two perspectives. While from the level of individual development and sense of identity the question of being a part of Nature or apart from nature is obviously a dialectical and a reciprocal one; from the point of the directions in which types of social systems move, it is a dichotomous one. Either the society sees itself as a part of Nature, which entails a set of social norms; or it sees nature as subservient, which entails another set. This is not to say that there cannot be variations on the theme; the great wild-goose chase between capitalism and Marxism as economic systems is indicative of that; rather it is that the systems necessarily head in very different directions.

There is a problem with the use of the word `environmentalism'. Not only is it cumbersome and hard to define, as O'Riordan has noted, but it has problems in its own *episteme*. An environment can only exist in relation to the being, or beings, whose environment it is. Just as no animal could exist without an environment, no environment can exist without an organism to be surrounded. The use of the term implies the presence of something to environ. A planet without life is a world, but it is not an environment (Ingold, 1987). Thus the use of the term places people at the centre of the debate; it must be their environment which is being discussed. While it is acceptable to use an expression like `the human environment', in which it is clear what is being discussed, using the term `environment' as a synonym for nature is incorrect. It is neither a generic nor a value free word - there is an element of possession in the term which makes it unsuitable for use in describing Green thinking. Instead, I would suggest a reformulation. Accommodation, as a coping mechanism, is perhaps more broadly used than O'Riordan suggests. To a greater or lesser degree, all of what he calls technocentrism is accommodation. More than that, I would argue that any communalism which is not clearly based on Green assumptions could also be labeled accommodating - it too is a coping mechanism. The lack of political critique O'Riordan notes as part of communalism suggests that it is often more a reaction to the crisis than a coherent alternative proposal. Since, as O'Riordan notes, the accommodating position is the one most people associate with environmentalism, why not limit the term to that? Environmentalism could then be any method of coping with ecological problems without challenging the axiomatic distinction between human and nature. It is the collection of coping techniques used within the DWEP, and for the sake of clarity will be used as such henceforth.

One of the central hypotheses of this dissertation is that axioms regarding the human-nature interface are in essence the root causes of ecological stress or lack thereof. Too many commentators miss this distinction. While they note ecological stress, and they note different attitudes to the human-nature question, they regard these as being suggestions for dealing with the problem, not as the causes in themselves. Certainly they are suggestions for dealing with the problem, but that does not reduce their more fundamental position in the creation of the problem in the first place. It has been demonstrated in this first section that the collection of axioms and assumptions which have accreted about the central theme of DWEP, namely human separating from nature, have been instrumental in leading to the present environmental crisis. It is therefore suggested that the problem will not be satisfactorily dealt with until the instrumental conditions have been dealt with. Thus a geography which fails to challenge the assumptions of the DWEP must necessarily fail to deal with the crisis. Since, however, it is a crisis with which geographers should be concerned, it is necessary for geography to adopt a different framework of analysis. It is necessary for geography to Green.

Chapter 4

PARADIGM REGAINED: The Roots of the Green Paradigm

Introduction

There are two questions which must be debated before one can begin a search for an alternative cultural paradigm. The first concerns the rationale for the search; is the Green movement simply the latest in a long line of millenialist cults? The essence of a millennialist movement is the vision of a change of social order, often through some catastrophic event. Thus the American survivalists, crouched in their bomb shelters, waiting for WWIII so that they can build a new nation can be counted as examples. So can numerous religious movements, Christian and otherwise, waiting for some significant event which will send all the bad guys off where they belong, and make the world safe for the believers, or alternatively take all the believers off somewhere nice. In this one can count satanists, Jehovah's Witnesses, and the cargo cultists of New Guinea as examples. Social movements too have their examples. The Marxist vision of the collapse of capitalism and the rise of socialism/communism makes it a candidate.

It is not the intention of this dissertation to pass comment on the likelihood of the various prophesies coming true. The concern at this point is that millennialist movements often get rather more carried away by their belief in a changing world than the evidence would suggest is really justified, and as a result tend to lose touch with the real situation, creating a changing world which exists only in their minds[1]. Is this the case with Green thinking?

There is certainly a millennialist element to `environmentalist' thinking, and one which would account for much of its political immaturity. The communalism to which O'Riordan refers would be an example of millennialist `environmentalist' tendencies, and there are numerous `environmentalist 'groups around the world which either foresee drastic change in the world, for which it is necessary to prepare; or who

1 Charles Manson, for example, was trying to start a race war in the USA which he thought would decimate the country while he and his followers hid in a cave in the deserts of the southwestern USA.

use the `fact' that they are trying to prevent such change to legitimate actions which might otherwise be considered criminal, or at least antisocial. Similarly many of the `green' political parties are both ecologically and politically naive, to the extent where they too might be considered millenialist (of course there are some who are not naive at all), foreseeing some eventual collapse of the present system which would pave the way for a new, green one which would prove them correct. Yet there is more to Green thinking than this. Not all Greens are members of obscure cults and organizations, and, as was argued in the previous chapter, most of those who are members of such are not really Greens.

Support for the idea that there is an ecological crisis comes from too many disparate sources for the supporters to be identified as members of a cult. Indeed there is little or no sense of common identity shared between the various groups which support the hypothesis of ecological stress; identity which is an essential identifying feature of a cult. Instead there seems to be an exploration of alternatives based on a collection of fairly sound evidence, if evidence can ever be said to be sound. The numerous studies, scientific and otherwise, certainly seem to suggest that there is a significant ecological problem, and that the problem is getting worse rather than better. Indeed there is more evidence that there is a problem than there is evidence that there is not - few people would argue that the present situation is a perfect one, and that there is an ecological balance between human activity and the rest of the planet. Given the broad measure of agreement around the issue of ecological stress, it would seem that a refusal to believe the problem exists is more psychologically suspect than an attempt to deal with the problem. Plus, of course, there is nothing to say that millennialists are necessarily wrong in their predictions. Yet the most telling point, and the one which completely removes the possibility of truly Green thinking (as opposed to incomplete or naive thought) is that there is no logical progression from the DWEP to the Green Paradigm. The Green Paradigm is not constructed as a next step which will automatically follow in the event of the collapse of the DWEP. It is a different set of axioms, with a different set of iterations. Just as there is no logical progression from Euclidian to non-Euclidian geometry (or vice versa) so there is no logical progression between the two cultural paradigms. Each possesses an internally coherent, self-supporting set of assumptions which lead logically to different sets of potential conclusions. Passage from one to the other cannot be forced. If the DWEP were to collapse, (something presently undesirable since it would more likely signify major damage to the ecosystem than a massive change of heart on the part of world leaders), it is unlikely that people socialized under the DWEP would be able to adopt the tenets of the Green Paradigm. It is far more likely that society would fragment and follow the example of the survivalists. Equally it is unlikely that societies framed within the

DWEP would suffer any sort of dramatic collapse. There are certainly historical examples of societies which have disappeared; the Greek, Egyptians, and the Romans, for example. Evidence suggests, however, that it was more of an economic decay as a result of overreaching on a limited resource base which led to the decline, as opposed to the sudden disintegration, of these societies. Given the present distribution of power in the world, a repeat of this historical trend would be accompanied by increased inequality between the First and Third World, and a recolonization as ever more peripheral and marginal land was pressed (quite possibly by force) in to service to supply the resource needs of the First World. Attempts to deal with resource shortages, including food, under the DWEP would be guided by `economic necessity' rather than ecological sensitivity, and would lead inexorably to a mining of the productive capacity of the planet, to say nothing of increased repression of Third World aspirations or concerns. Given that the concerns of inhabitants of tropical forests are readily ignored in the process of the clearance of these forests; even to the extent of using force to quell dissent, there is a clear precedent for the extension of this attitude to other resource concerns. Given too that the trend is not towards the equality and egalitarianism envisioned by Green thinkers, and that a physical collapse of the DWEP, far from clearing the way for the implementation of the Green Paradigm, may cause sufficient disruption to render it impossible, it is not tenable to link the two paradigms in a logical and necessary sequence. Without a sense of an inevitable progression towards an improved future, Green thinking cannot be classified as millenialist.

The second thing which must be considered is the philosophical validity of attempting to construct a framework of values based on the non-human world. Does such an attempt not commit the Naturalistic Fallacy of deriving an `ought' from an `is'?

There are four methodologies which have been used in the past to justify social or moral philosophies:

> a) that God is the final source and authority, however His will is revealed;
>
> b) that the philosophies rest on intuitions which are self-evident;
>
> c) that the only real source of value is the human will, and that values are chosen sincerely, but irrationally or non-rationally; and
>
> d) that the values are justified by reference to facts about the world and ourselves.

The problems are as follows; the secular present will not accept a) without some universally witnessed miracle. Route b) faces the problem that different people hold different intuitions about the truth. Route c) is the one on which our social philosophy is structured at present, but it is openly based on completely arbitrary choices, and it is not possible to say whether matters which pertain to the will are true or false. Route d) has frequently been rejected by philosophers on the grounds that it apparently commits the `Naturalistic Fallacy' (Lee, 1989).

There are, however, arguments against this assumption, and which suggest that method d) may be useful. It is true that obtaining a normative proposition from a factual proposition constitutes a fallacy. It is, however, possible to create an epistemic relationship between an `ought' and an `is', thus creating a logical framework which will allow a rational passage between factual evidence and normative or prescriptive conclusion (Lee, 1989). An epistemology can be created based on factual evidence, and norms can be drawn from epistemologies. This is based on the assumption that one of the minimum expectations of humans (and even of social philosophers), is to perpetuate the species and ensure its continued well-being. Should evidence suggest that the continued welfare of the species may be under threat, it would be irrational to continue along the course which causes this change. It is common to talk of `saving the planet'. The planet, however, is not under significant threat. Presently existing life forms, including humans, are. If, as is not impossible, the continued buildup of CO_2 in the atmosphere were to lead to a sudden change to an oxygen poor atmosphere, wiping out most life forms, the planet would survive. In the past Earth had an oxygen poor atmosphere, and life continued to evolve. People, however, would not survive such a change, and nor would the world with which they are familiar.

While the essence of Green thinking is to move away from such anthropocentrism, it is important to demonstrate that an alternative cultural paradigm is philosophically defensible. It is argued here that an alternative cultural paradigm is necessary if we are to avoid ecological collapse, a collapse which will negatively influence human existence. If this is a valid statement, then failure to adopt an appropriate alternative would constitute irrational behaviour, and should be condemned by social philosophers.

There is not yet a book of rules for Green thinking, and given the nature of the approach, it is unlikely that there ever will be. This makes it particularly difficult to identify the central and salient points of Green thought, especially with the non-essential wishful thinking that has been hitched to the Green band-wagon. What can be said at this point is that Green thinking is not a readily useable scientific tool; it does not simply slot into conventional practices, because it arises from a different set of assumptions. It is less a theory than it is simply a way of looking at things

THE GREEN PARADIGM

One of the earliest examples of the word *Green* used in the holophrasic sense to mean all that it does today can be found in Andrew Marvell's poem, *The Garden*, written in about 1650. In this Marvell alludes to the futility of a perception which achieves no more than the artificial separation of people from nature. Far wiser, for him, to try to appreciate things as they really seem to be. How vain, futile, and arrogant to sacrifice the whole for the sake of a part.

> How vainly men themselves amaze
> To win the palm, the oak, the bays,
> And their incessant labour see
> Crowned from some single herb or tree
> Who's short and narrow verged shade
> Does prudently their toils upbraid,
> While all flow'rs and all trees do close
> To weave the garlands of repose.
>
> ...
>
> Meanwhile the mind, from pleasures less,
> Withdraws into its happiness:
> The mind, that ocean where each kind
> Does straight its own resemblance find,
> Yet it creates, transcending these,
> Far other worlds, and other seas,
> Annihilating all that's made,
> To a green thought in a green shade.

For Marvell, *Green* is a metaphor of infinite imaginative fertility. Green, as the colour of spring, has long symbolized rebirth and life. It is possible to extract from the burgeoning Green literature, and from older texts, such as Lovejoy's (1942) *The Great Chain of Being*, and Glacken's (1967) *Traces on the Rhodian Shore*, as well as from Plato and Aristotle, the key elements that distinguish the Green Paradigm from the Dominant Western Environmental Paradigm. Just as Copernicus overturned the Ptolomaic paradigm by pointing out that the universe is not centred around the Earth, so the Green Paradigm points out that the universe is not centred around people either. This may look like a fatuous statement, but it is only when one begins to examine the structures of society, including science, that one begins to realise the implications of the perception.

There is a certain irony in this; for the most part science has been directed at attempting to control nature for human use, and yet it consistently produces evidence that people are an integral part of Nature, rather than being above it. Nature is a complex system in which humans have a role to play, but Green thinkers point out that the system is not there for the sole benefit of *homo sapiens*. It makes no sense for one part of a whole to exploit another to the ultimate detriment of the greater whole. The Green Paradigm accepts that human society is an ecosystem. It is not *like* an ecosystem, it *is* one; a complex network of relationships between humans and their environment. It is composed of smaller systems, and in turn forms a part of larger ones. As such it is subject to similar limitations and natural laws as other ecosystems, similar goals and development processes. In spite of this almost all human societies, certainly the industrial and post-industrial ones, operate on the assumption that the Earth is a collection of resources there for people to dispose of as they see fit.

The Green Paradigm is a different way of looking at the human place in Nature. In this regard, it is possible to identify the increasingly sophisticated models which have been applied to the question of the human role in the scheme of things. One of the earlier Western models was the Great Chain of Being, a strict hierarchy with God at the top, descending through angels to Man, and then to simpler and simpler forms (Lovejoy, 1942). In this the human position was fixed in relation to all the others, encouraging an attitude of humility before the higher orders, and stewardship over the lower. To break the chain was to interfere with the divine order. Over the millennia this model changed under the influence of science and society, evolving at last into a sort of planetary or atomic model. Once science did away with the need for a God to explain phenomena, the upper reaches of the Great Chain of Being dissolved. In its place was left a goal-less hierarchy, which shaped itself along the scientific models of the time into discrete atomic systems, with humans at the centre, and the universe expanding out from that point, revolving around them in increasingly irrelevant and subordinate spheres. *Homo sapiens* is taken as the point of reference in all debate on questions of rights and value, because they have become, in effect, the centre of the universe.

Green theory is a further sophistication of interpretation of the human place in life, but differs radically from earlier interpretations. However, the Green perception of reality accords far better with the insights offered by the leading edges of physics and other sciences than does the anthropocentric model. The Green perception suggests a network of relationships, a complex system with no centre and no hierarchies; just overlapping types of interconnections. It may be holonomic, where each part contains the whole; certainly it is holistic insofar as the whole is greater than the sum of the parts. In terms of reaching this perspective O'Riordan (1989) is correct in placing Green thinking at some distance along a sort of greening continuum. If raised and educated within the constraints of the DWEP, it is only natural that one's initial responses to perceived ecological stress would be some sort of accommodation. One would only move to a more radical perspective as the shortcoming of `environmentalism' became apparent. Thus it is with this dissertation; there is a progression of assumptions, ideas, theories, anomalies, and crises. Many of the anomalies of the DWEP form foundations for assumptions of the Green Paradigm. Not all the strands of the new paradigm can be traced in a limited space, any more than all those of the old one could. There is also the difficult question of where on this continuum one places the numerous movements which have challenged the social legitimacy of some aspects of the DWEP, and which have thus in some way contributed to the degree of political sophistication which marks true Green thinking. These can only be mentioned in passing, for though their contribution was significant in developing tools of social analysis and ideas about justice and fairness, the critique was not aimed at the assumptions of the human-nature interface. If this dissertation is to be kept within any sorts of manageability it must limit its analyses to carefully defined issues. What is important, however, is that it is possible to get from the DWEP to the Green Paradigm by asking enough questions. This raises another point; not all the responses to the ecological crisis have been positive - one thinks, for example, of the lifeboat ethic of the Neo-Malthusian. Yet many such responses are valuable in that they demonstrate a particular inadequacy of a response. In this particular instance what was demonstrated was the need for a detailed social analysis as part of a new cultural paradigm. Failure to incorporate issues of social justice produced fatal flaws in the lifeboat analogy, but provided further vindication of the direction of the emerging Green alternative and the necessity of including in this a political and social sophistication.

If the Middle Ages had its Great Chain of Being, and the DWEP has its `atomic reality', then the Green Paradigm too has its model. In the earlier parts of this century James Jeans (in Capra, 1982, p. 76) identified the model in this: "Today there is a wide measure of agreement...that the stream of knowledge is heading toward a non-mechanical reality; the universe begins to look more like a great thought than a great machine". Similarly, Heisenberg (in Capra, 1982, p. 70) said "The world thus appears as a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and thereby determine the texture of the whole".

Green also brings with it a new philosophy, one which it is almost impossible to understand using the old perception as a frame of reference. There is a Green ethic, a morality, which is based in the relationships that exist in the real world. People are a part of a system. An action is good when it tends towards the stability and integrity of the system; it is less good when it tends the other way (Leopold, 1949). It is almost impossible to understand the Green Paradigm separate from this new philosophy. Concepts such as `rights' and `value' have little place within the Green Paradigm, because they are almost invariably based on some comparative measure. Under the Dominant Western Environmental Paradigm, for example, one might say that a person has more rights than a fish, that a tree has more value than a rock. When one thinks of rights, one immediately thinks of humans. *Rights* and *value* are terms which are meaningless without people. Like other aspects of the Dominant Western Environmental Paradigm, these terms require humans as the ultimate measure. In the final analysis humans have rights because humans say they have rights. Those working within the assumptions of the Green Paradigm point out the increasing evidence that people are not the centre of the universe, and suggest that any system which assumes that they are is necessarily going to be faulty.

As was the case with the Copernican Paradigm Shift[2], the awareness created by the Green Paradigm can be stated quite briefly, even if the full implications and workings of the paradigm require more explanation and understanding. The Copernican paradigm makes a useful analogy for the Green Paradigm, conveying a thought revolution in few words: the Copernican Paradigm contained the implication that the universe is not centred around the Earth; the Green Paradigm states bluntly that the Earth is not centred around the Human.

The statement is deceptively simple. As is the case with other paradigms, the emergence of the Green Paradigm is the culmination of a long history of thought, research, and developing attitudes. While there is a growing body of literature which traces some of the ideas which have culminated in this paradigm, the path is not as well marked as in the case of the Dominant Western Environmental Paradigm. Just as it was impossible to chart all the important developments which gave rise to that paradigm, so too only the faintest outline of the Green Paradigm can be traced here. In addition not all of the areas which potentially offer support to the Green Paradigm are covered here. Those that are highlighted are not exposed in great detail at all; the depth and complexity of supporting ideas is such that an examination of this type could go on indefinitely. To avoid this it has been necessary to limit the scope of enquiry and the depth of examination of each particular field. Any one of what are presented here as roots of the Green Paradigm could provide material for a dissertation in itself, and indeed many have already resulted in books. Instead what must be noted is the degree to which apparently disconnected areas support both the assumptions of the Green Paradigm and one another. It is contended here that the mutual support of these 'roots' and the perspective they are purported to encompass, is at least as comprehensive as the network which supports the DWEP. Furthermore it is suggested that together they show fewer anomalies than the DWEP, are more amenable to holistic investigation. It is thus contended that as a cultural paradigm, the Green Paradigm is at least as defensible or valid as the DWEP and in fact appears more so. Indeed the Green Paradigm has the potential to provide a core for a re-interpretation of the role and

2 A change in the institutional paradigm of science which had significant impacts on institutional paradigms of religions as well as on cultural paradigms and Western cosmology.

structure of geography, and many of the pioneering thinkers who have contributed towards the development of the holistic framework of the Green Paradigm were themselves geographers, for example George Perkins Marsh, Clarence Glacken, Petr Kropotkin, and Edward Lorenz. Support for the Green Paradigm can thus be expected to grow at the expense of support for the DWEP. It is important to see the Green Paradigm as a cultural paradigm, even if many of its central themes have been aired before. It is only as a coherent and self-supporting whole, as a paradigm, that the dismissal or colonization of these themes can be avoided.

Some Historical Roots of the Green Paradigm

The investigation could start almost anywhere in history - the idea encapsulated in the Green Paradigm is one which resurfaces time and again, in various guises (Pepper, 1984). Bearing in mind the comment that the safest generalization that could be made about European philosophical tradition is that it consists largely in a series of footnotes to Plato (Lovejoy, 1942), perhaps it is reasonable to begin with the Greeks.

The two main strands of philosophical thought have been identified; *otherworldliness,* and *this-worldliness.* Otherworldliness is the approach which sees ultimate value as residing elsewhere, and which frequently goes so far as to deny the reality of the world of experience, claiming it to be without meaning. In contrast, this-worldliness places importance and meaning on experience of the real world. Tracing their history in Occidental thought, it becomes apparent that both schools owe their characteristic form, phraseology, and dialectic to the work of Plato (Lovejoy, 1942).

In his otherworldly strain, Plato reaches his climax with his Idea of the Good. For him, as for most Greek thought of the time, `good' lay in self-sufficiency and freedom from all dependence on what was external to the individual. When `the Good' was made the essence of the supreme reality, the term retained its connotations, but they took on an absolute and unqualified sense. It was an idea which was to dominate Western religious thought for two thousand years, and which remains potent in the DWEP, although it is seldom articulated.

> "If by `God' you meant - among many other and seemingly incompatible things - the Being who is, or eternally possesses, the good in the highest degree; and if `the good' meant absolute self-sufficiency; and if all imperfect and finite and temporal beings are, as such, not to be identified with the divine essence - then it manifestly followed that *their* existence - that is, the existence of the entire sensible world in time, and of all conscious beings who are not in any sense self-sufficient - can bring no addition of excellence to reality. The fullness of good is attained once for all in God; and `the creatures' add nothing to it. They have, from the divine point of view,

> no value; if they were not the universe would be none the worse" (Lovejoy, 1942, p. 43).

The link between this otherworldliness and the DWEP with its faith in the `value-free' facts of science becomes apparent here. Descartes' subject-object dichotomy and Hume's fact-and-value distinction; those cornerstones of the DWEP, are refinements of the otherworldly perspective.

Plato, however, appeared not to be content to remain in a world which offered no explanation for the mundane and imperfect things which inhabited it. In *Timaeus* he introduced two crucial questions: firstly, why was there a world?, and secondly, what principle determines the number of kinds of beings that make up the sensible and temporal world? These are questions which philosophy, under the influence of the DWEP, has ceased to ask. But as Lovejoy puts it:

> "to acknowledge that such questions are necessarily insoluble or meaningless is to imply that, so far as we can judge, the world is in final analysis non-rational, that its being at all, and its possessing the extent that it has and the range of diversity which its component exhibit, and its conformity to the very curious set of primary laws which empirical science discovers - that these are just brute facts for which no intelligible reason can be given, and which might equally well have been other than they are. If that is the case the constitution of the world is but a whim or an accident" (1942, p. 47).

For Plato these were questions which could, and which should, be asked. The legitimacy of the questions came under attack on numerous occasions during the development of Western thought. Finally they proved so antithetical to the DWEP that they to all intents ceased to be asked, except perhaps by those physicists working at the edge of experience of reality. Yet the similarity to Kates' question of our appropriate relationship with Nature is worth noting.

Plato not only asked the questions, he provided answers for them. His answers are interesting, but the philosophical debate on whether they are sufficient is beyond the scope of this dissertation. What is important is that Plato, having created the otherworldly perspective, was dissatisfied with its implications and rejected it in favour of a perspective that found some value in experience of reality. In the *Republic* Timaeus gives the reason why whoever did construct Becoming and the universe did so:

> "he was good, and in one that is good no envy of anything else ever arises. Being devoid of envy, then, he desired that everything should be so far as possible like himself" (509b).

Retaining the Platonic understanding of `good' signifying self-sufficiency, in the *Timaeus* the excellence of the world consists in a sort of relative and physical self-sufficiency. The material universe was carefully designed so:

> "that all its active processes and all its passive processes occurred within itself and by its own agency, since he that constructed it deemed that it would be better if it were self-sufficient rather than in need of other things" (33d).

Here, stated succinctly and clearly in a text over two thousand years old, are some of the central ideas of modern ecology, of the Gaia hypothesis, and of the Green Paradigm itself. The world is complex, and its components are necessarily interrelated in its maintenance of self-sufficiency.

A paradigm shift involves more than the simple inversion of the previous paradigm; it is a dialectical process which involves the synthesis of the old paradigm with its critiques and corollaries, in order to create a new understanding that is in itself a step forward. The problem of value which was raised as a critique of the Dominant Western Environmental Paradigm has not been completely solved in the emerging Green Paradigm; indeed there are some who think that value is not a problem at all (Fox, 1989a). But it must be remembered that the Green Paradigm is still in its infancy. There are many suggestions and possible solutions to the issue of value and non-anthropocentric morality - Spinoza, for example, is seen by many Deep Ecologists as holding a key (e.g. Naess, 1975; Devall and Sessions, 1985).

One suggestion, made in *The Moral Status of Animals* (Clark, 1977) and re-iterated in 1985 (Zimmerman)[3], is Aristotle's concept of *telos*. For Aristotle, morally sound people do what they believe is necessary and appropriate for them to fulfil their individual *telos*, which is consistent with the *telos* of the community. Aristotle does not speak of compulsion or of use-value or of rights. His is a fundamentally realistic approach; appropriate or moral behaviour entails acting in accordance with the way things are experienced. The humanity of humans is in their practicing the virtues which promote their *telos*. What has happened is that people no longer know what the *telos* is, and have lost sight of who they really are. The contention is that the scientific *ethos* which is so prevalent in the DWEP does not and can not lead to a healthy relation between human and non-human (Zimmerman, 1985). Faith here is placed in Aristotle's belief that sharing is one basis on which a moral community can be formed. A morally sound person will give and receive with gratitude. Under the Dominant Western Environmental Paradigm such a relation has largely disappeared from the human world, and in no way informs relations with the non-human. For some, however:

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3 I would like to thank Prof. Zimmerman for his generous assistance with some of these issues.

> "it is more likely that the earth will be healed by our released tenderness than by any more technology of the modern kind" (Clark, 1977, p. 162).

One of the most revealing signs of the shifting paradigms is the emergence of a new breed of philosopher, the *ecosopher*, and their *ecosophy*. Combining *ecos* and *sophia* to give an earth-centred wisdom, they have made the study of the new morality and set of values their particular focus; a development of a daring not common in the rarified air of conventional philosophical discourse (Por, 1974; Naess, 1987).

Holism and Smuts

Another issue central to the philosophy of the Green Paradigm, but one which is not concerned primarily with value and morality, is the question of approach. The Green approach is essentially holistic. Again this is a term which is in common use, but which possesses a specific meaning and history which is not as commonly understood. It is a term which Jan Smuts coined (from the Greek for whole) to describe the "fundamental factor operative towards the creation of wholes in the universe" (1926, p. 86).

Smuts (1870-1950) is a thinker whose work has suffered undue neglect[4]. He was an Afrikaans farm boy who started school under protest at the age of ten, but who took to study with enthusiasm that alarmed the family (fearing for his health they at one point hid his books). He won a scholarship to Victoria College in Stellenbosch (South Africa) at 15, where he took a double B.A. in Literature and Science, intending to be a churchman. He then won a scholarship to Cambridge, after which he returned to South Africa as a lawyer. At 28 he was made Attorney General of South Africa. In the Anglo-Boer war he fought on the boer side, within a few years the First World War began, and breaching a tide of anti-boer sentiment he eventually became a General in the British Army, later a Field Marshall, was instrumental in the founding of the Royal Flying Corps (later the RAF), and eventually Prime Minister of South Africa. It was his party which lost the 1948 South African general election to the Nationalist Party and their system of apartheid. Although brilliant, in many ways and attitudes he was a product of his time. In many more he was way ahead - when drawing up the Charter for the League of Nations, for example, he used his position as a Field Marshal to oppose military conscription, seeing the League as a means to prevent further wars. A religious man who had been forced to fight, he felt conscription was the "taproot of militarism, and unless it is abolished all our labours will eventually be in vain" (Smuts, 1918). His proposal was rejected, which was unfortunate, because had it been accepted it might have prevented some of the numerous wars which have occurred since then.

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4 A few biographical details seemed necessary in introducing Smuts, a largely forgotten figure in this field. There are extensive biographies readily available elsewhere.

Smuts' Holism evolved in response to his thoughts on a particular problem:

> "The close approach to each other of the concepts of matter, life and mind, and their partial overflow of each other's domain, raises the further question whether back of them there is not a fundamental principle of which they are the progressive outcome" (Smuts, 1926, p. 85).

Smuts was perhaps the first thinker to attempt to assimilate the implications of Darwin, Einstein, and the Quantum Physicists. In doing so he recognized the limits of mechanistic science[5], and the necessity for a broader explanatory system. His book *Holism and Evolution* (1926) contains chapters on the reformed concepts of Space-Time and Matter, as well as a focus on the implications of Darwin's Evolution. Smuts suggested two conceptions of genesis have prevailed over time; one regards all reality as given in form and substance at the beginning, and all history as merely the unfolding of the implicit content - a past creation which determines the whole future and bans from the universe all fresh initiative, creativeness, or novelty. The second view suggests a minimum was given in the beginning, and allows Evolution to create reality. For Smuts such a view liberated the present and the future from the past, and made freedom an inherent character of the universe. His Holism was an attempt at a universal theory of Evolution, a philosophy of freedom.

Smuts saw Creative Evolution as involving both general principles and tendencies - (as studied by philosophy), and concrete forms and structures - (as studied by science). For him, both are necessary to reality, and both must be studied because one cannot be deduced from the other. A whole is not an artificial thought construct, it is an indication of something real in the universe; Holism is the operative factor. Nor should the idea of wholes and wholeness be confined to the biological domain;

> "it covers both inorganic substances and the highest manifestations of human spirit. Taking a plant or an animal as a type of a whole, we notice the fundamental holistic characters as a unity of parts which is so close and intense as to be more than the sum of its parts; which not only gives a particular conformation or structure to the parts, but so relates and determines them in their synthesis that their functions are altered; the synthesis affects and determines the parts, so that they function towards the 'whole'; and the whole and the parts therefore reciprocally influence and determine each other, and appear more or less to merge their individual characters; the whole is in the parts and the parts are in the whole, and this synthesis of whole and parts is reflected in the holistic character of the functions of the parts as well as the whole" (Smuts, 1926, p. 86).

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5 One example was a debate which was published as *The Nature of Life: discussions at the British Association July 25, 1929*, Juta & Co., Cape Town.

Smuts sought to extend Darwin's Evolution to cover the entire universe, not just plants and animals. In the case of each individual, the whole is the creative source of reality; the term Holism was coined in order to cover the infinity of such wholes throughout the universe under one concept. It is both a concept and a factor; a concept in that it stands for all wholes, a factor because the wholes it denotes are the real factors of the universe. Just as matter can be taken to mean all particles of matter in the universe, so Holism is all the wholes in the universe. This is a use of the word which has become less common, although for Smuts it was primary to understanding the use of the word as a theory of the universe and reality. The whole formed the substantive factor for the concept Hol-ism, just as matter and spirit are taken as the substantive factors for the concepts of material-ism and spiritual-ism (Smuts, 1926).

> "Holism ... [is] the ultimate synthetic, ordering, organizing, regulative activity in the universe which accounts for all the structural groupings and syntheses in it, from the atom and the physico-chemical structures, through the cell and organisms, through the Mind in animals, to Personality in man. The all-pervading and ever-increasing character of synthetic unity or wholeness in these structures leads to the concept of Holism as the fundamental activity underlying and co-ordinating all others, and to the view of the universe as a Holistic Universe" (Smuts, 1926, p. 317).

In the last chapter of his book, Smuts expresses his concern that from a strict and narrow view science might see Holism as extra-scientific, providing a metaphysical rather than scientific explanation. He rejects such a perception for three reasons:

> "In the first place, the conclusion to which Science is pointing, namely, that the whole universe, inorganic as well as organic, is the expression of cosmic Evolution, necessitates a ground-plan which will formulate and explain this vast scientific scheme of things. Mere pre-occupation with detailed mechanisms will no longer suit the immensely enlarged scope of present-day Science. In the second place, Science has already had to assume such ultra-scientific realities as, for instance, the ether of space, as necessary to give a coherent explanation of even purely physical phenomena. And the correlation of the physical and organic and psychical in one vast scheme of Evolution similarly necessitates much more widely operative factors than have previously been recognized. Holism is far more necessary for cosmic Evolution than was the ether for light transmission. In the third place, Holism is essentially no more ultra-scientific than are life and mind; it is simply a wider concept than either and is the genus of which they are the species. And it enables all the evolutionary phenomena of Nature to be co-ordinated under and traced to the same operative factor.
>
> The New Physics has traced the physical universe to Action; and Relativity has led to the concept of Space-Time as the medium for this Action. Space-Time means

> structure in the widest sense, and thus the universe as we know it starts as a structural Action; Action which is, however, not confined to its structures, but which overflows into their `fields' and becomes the basis for the active dynamic Evolution which creatively shapes the universe" (Smuts, 1926, p. 317).

Smuts was correct in his prediction that science would fail to acknowledge his theory. Holism does, however, remain vital (in both the common and the etymological sense) and can still provide a rich source of ideas, as well as illuminate some fundamental problems and possible solutions which will doubtless be more fully aired as the Green Paradigm gains strength. Indeed if Holism were to be accepted as a theory of reality, it could offer a way out of the value and morality problem that besets the DWEP. If everything in the universe is a whole, and is itself part of a larger whole, then it is patently ridiculous to give value only to some parts of the whole and not others. Similarly, to paraphrase Leopold, an action would be morally correct when it tended to contribute to the whole, and morally wrong when it tended otherwise.

Feminist Support for the Green Paradigm

It is an unfortunate necessity that feminism is at its strongest when used as a critique. Unfortunate because feminism raises vital points, and it is a pity they have to be presented as negatives - the exposure of the psycho-sexual roots of science is a good example. A necessity because it would be extremely difficult for a feminist writer to suggest that a feminine approach to a problem might be superior to a masculine one without appearing to suggest that feminine is necessarily good and masculine is bad. Nevertheless there are more examples of what can be termed `reductionist feminocentrism' which suggests just that, than there are of suggestions that some sort of blending of masculine and feminine characteristics within individuals would enhance their understanding of the problem at hand. This is a subtle distinction; Eco-feminism (in common with some other branches of feminism) suggests that characteristics which have traditionally been labeled feminine are as important as characteristics which have traditionally been labeled masculine. It thus rejects both the conventional notion that the masculine is superior (stronger/bigger is better) and its feminocentric[6] opposite, that the feminine is superior. Eco-feminists, notably social eco-feminists as opposed to cultural eco-feminists[7] assert that neither is superior, neither inferior; at different times, some approaches are appropriate and others are less so. Eco-feminism acknowledges, however, that the feminine has long been undervalued, and that some sort of positive steps to address this undervaluation are necessary.

6 Admittedly this reductionistically feminocentric perspective is usually found as a misinterpretation of feminism, rather than a serious academic argument.
7 Cultural Eco-feminists, in fact, are frequently guilt of this reductionist feminocentrism, and this discussion focuses more on the Social interpretation.

The strength of the feminist critique of science remains invaluable, particularly within the Green Paradigm. It is unrealistic to expect science to rid itself of its androcentrism (male-centredness) overnight. Science remains a valuable tool and ally of the Green Paradigm, but cannot, and indeed should not, shake its history. What this implies is that even ostensibly `green' ideas may be androcentric when examined closely. An example may be in order. Assume there is a proposal to declare an area wilderness, to fence it off, and protect it. It appears to be a sound idea; in fact, given the realities of the situation, it may be the only way to save an area. But it is an idea which is predicated on domination, exclusion, and power. The whole concept places humans in a position of control over Nature (including other humans). It may be the only practical solution, but it is not the ideal, and the ideal should not be forgotten when making decisions. The ideal would see humans with sufficient understanding and empathy for Nature not to need crude external controls on their behaviour. In the ideal, such a proposal would not be necessary.

The feminist critique is not limited to the history of science. Gender studies are invaluable tools in contemporary political studies, and are particularly revealing of the nature of social structures, and the geography of gender has made significant contributions to analyses of both First and Third World conditions (e.g. WGSG, 1984; Momsen and Townsend, 1987). Feminist critiques of working conditions, of social equity, of militarization, and of health are all valuable contributions to the comprehensiveness of the growing Green critique. Indeed it must be stressed that while Eco-feminism is a position within feminism which has a particular contribution to make to the Green Paradigm, other branches of feminism have equally important contributions to offer.

The point remains that many of those characteristics associated with masculinity, for example aggression, strength, and dominance, are extremely destructive, while many associated with femininity (caring, empathy, and nurturing) are healthy. Many of the values lauded within the DWEP are patently masculine, and their exposure as such is a vital component of developing an alternative. A feminist approach to Nature must be at least in part a critique, because the approach at present is essentially masculine - even the suggestion of alternatives in this instance would be a critique. The challenge to the DWEP has already been presented, the alternative proposed by Eco-feminism, as an interpretation of feminism, is simple. It has been pointed out that women can claim their past without being chained to it, and it is a past which is more involved with nurturing than is men's (Hallen 1987). A nurturing, caring relationship with Nature would preclude ill-use, reject abusive power relations, and promote a healthier and more complete picture of the human place in the scheme of things.

Quite ironically this Eco-feminist perspective accords well with an idea which is gaining increasing support in theoretical ecology (e.g. Bramwell, 1989) the Pioneer and Climax systems. Ironic because of some of the Neo-Darwinist assumptions implicit in this model. A Pioneer ecosystem is an ecosystem in its earliest stages of development; for example where a jungle is encroaching on an abandoned human settlement. A pioneer ecosystem is highly productive, although it is random and competitive. It is also a particularly individualistic system, because it is largely free of internal controls which would exist if it were part of a system. This lack of internal control means the system is susceptible to outside force as crude controls, resulting in an inherently unstable regime marked by structural changes (e.g. population die-off) as a response to an outside change (Goldsmith, 1988a).

A Climax ecosystem, on the other hand, is particularly unproductive because it is in a stable relationship with the biotic, abiotic, and climatic circumstances. It is interesting to note that a climax system is generally assumed to follow the pioneer system, unless prevented from doing so. In other words, ecosystems appear to develop towards stable states, although they are frequently prevented from getting there, and the stable state is often quite short before it is disrupted and the ecosystem reverts to pioneer state. This disruption is generally a result of an outside force, however. The characteristic features of the climax ecosystem are almost the opposite of the pioneer system; individuals are integrated into the larger whole at different levels of organisation; family, small community, larger community, ecosystem, etc (cf. the levels of wholes in Smuts' (1926) Holism). The existence of the wholes necessitates co-operation, and this implies that controls within the system are internal, not externally coercive (Goldsmith, 1988a). From another point the whole issue of stability is subjective, but if an analogy is drawn to chaos theory, stability need not mean lack of movement or variation, and the repetitive cycle between the two states, although random in response to outside forces, could in itself be described as stable.

It requires no great leaps of imagination to recognize parallels between gender characteristics and ecosystem characteristics. The similarities are startling: Masculine (aggression, domination, strength, power-seeking) and Pioneer (randomness, individualism, competition, crude external control); Feminine (empathy, nurturing, caring) and Climax (order, wholeness, co-operation, stability, internalized control). What should also be remembered at this point is that human society is an ecosystem; it is not *like* an ecosystem, it *is* one.

While pioneering behaviour by humans may have been appropriate in the past, this is no longer the case. The Earth has been well and truly populated; further pioneering behaviour is justified by a mythical frontier, a frontier which no longer exists on this planet. Pioneering behaviour is fundamentally destructive and unstable; Eco-feminism in essence suggests that humanity must move to adopt a climax pattern if it is to actually start living within the dictates of the Green Paradigm. Feminine characteristics may offer an appropriate model.

Religious Support for the Green Paradigm

Much support for the DWEP can be claimed from the Bible, particularly sections of the Old Testament. White (1967) and others suggest that extracts of biblical text have provided justification for humanity's despotic attitude towards nature; this perception was discussed more fully in Chapter 2 above. As was mentioned at the time; this is not the only attitude towards nature which can be divined from the Bible. Passmore (1980) and others (e.g. Santmire, 1981; Joranson and Buttigan, 1984) suggest that the real message is one of stewardship, and quote texts to validate their claims. Still others point out that it is something of a fatuous debate, and that religious beliefs are far too complex to be reduced to a few quotes (Tuan, 1970; Kay, 1988). While the validity of this statement is accepted without question here, this thesis does, however, maintain that it is the nature of a paradigm to garner support where it can. Supporters of a paradigm reinforced in their beliefs by scientific and other evidence will interpret an ambiguity in their own favour. In other words, supporters of the DWEP may choose to validate their opinions by using favourable biblical `evidence', and ignoring the fact that contradictory `evidence' may exist, or that if used in the context of the whole text, the message may be very different. As Glacken said of the issue:

> " ...one must not read these passages with modern spectacles, which is easy to do in an age like ours when `man's control over nature' is a phrase that comes as easily as a morning greeting. Is this idea of dominion anything more than a distillation of everyday observation of techniques involved in the care of plants - gardening and oasis agriculture, grain growing and horticulture - the ability to kill the wild and subjugate domestic animals - putting the latter to work in the task of agriculture, herding, or transport, or using their bodies for food and clothing?...Man's power as vice-regent of God on earth is part of the design of creation and there is in this fully elaborated conception far less room for arrogance and pride than the bare reading of the words would suggest" (1967, p. 166).

In a particularly detailed account, Kay (1989) examines the Old Testament in terms of its literary style and methods, and contextualizes these; given that the Bible was written by traditional pastoralists and agricultural societies. Based in such a context, it is presumed that the Bible must express explicit beliefs about the environment; beliefs which need have nothing at all in common with any modern environmental beliefs. Indeed it is to be expected that the Bible will have more in common with beliefs of other pre-industrial cultures than it will with any form of modern scientific understanding.

The context presented is indeed very different. The present Western notion is that humans either have positive or negative attitudes towards nature and that these attitudes will result in the environment respectively either improving or deteriorating. The traditional, pre-scientific model exemplified in the Bible is that a deity requests people to perform or abstain from some action. It is up to the humans to decide whether to obey or not. If they obey, the deity rewards them with certain control over their environment; if they disobey or are careless, the deity may turn nature against the people. Human control of the environment is entirely at the discretion of God in the Bible, and in most other religious systems (Kay, 1989). Indeed the Israelites are warned by Moses against holding the modern conception of environmental change; since if they came to believe their prosperity and power was as a result of their own efforts, they would lose belief in Providence (Deut. 8:11-18).

This implies that neither the despot nor the stewardship interpretation is the valid one. In terms of the literary structure of the Bible, they may both be features of a dialectical construct. Contradiction abounds within the Bible, and is an important technique in its imparting a message (Alter, 1981). If one accepts this, then it becomes reasonable to assume that the early injunctions to subdue the Earth and dominate the creatures will be counterbalanced as the narrative develops (Kay, 1989). Kay also points out that the theme of human dominion over nature is developed as a blessing throughout the text. A blessing does not give automatic benefits - it is always up to the recipient to ensure that they are worthy, in God's eyes, to receive the reward; dominion over nature is therefore not necessarily a given, even if one chooses to use only those passages favourable to the idea. Alter, in fact, rejects the entire notion of fixed definitions in ancient Hebrew literature:

> "Indeed, an essential aim of the ... ancient Hebrew writers was to produce a certain indeterminacy of meaning ... Meaning was conceived as a process, requiring continual revision - both in the ordinary sense and in the etymological sense of seeing again - continual suspension of judgement, weighing of possibilities, brooding over gaps in the information provided" (1981, p. 12).

God tells Adam and Noah to dominate the Earth and subjugate nature; but their decedents are continually prevented from doing so, punished through nature for their wrong-doing, and shown that their dominion can be revoked at any time. Later in the Bible, it is stressed that people do not even understand nature, let alone control it:

> "Will the wild-ox be willing to serve you?
> Or will he abide by your crib?
> Can you bind the wild-ox with his band in the furrow?
> Or will he harrow the valleys after you?
> (Job 39:9-10)
> ...
> Does the hawk soar by your wisdom,
> and stretch her wings toward the south?
> Does the vulture mount up at your command
> And make her nest on high?"
> (Job 39:26-27).

This can be interpreted as another instance of biblical antithesis; the inability to subjugate wildlife is not considered the outcome of sin, but is the normal condition.

> "Humans may, on good behaviour, serve as nature's managers, but true dominion belongs only to God...The very concept of [human] dominion, indeed, evolves in the course of the text from a bold and simple assertion to a dream that is thwarted through normal human frailty" (Kay, 1989, p. 227).

Attempts to justify human domination of nature by the selective quotation of biblical extracts are unjustifiable. Evidence suggests that the more correct interpretation of the biblical attitude to human-environment interactions would be that humans have a right to manage the land so as to ensure their own survival; they do not, however, have the right to treat the world as they might wish, because ultimately they only have it on loan from God. Humans are thus a part of the world; incorrect behaviour on their part may lead to retribution in the form of environmental stress (e.g. drought or plague) over which they can have no control. Human dominion over nature is extremely limited, and is an exception rather than the norm.

Further support can be found in *The Assisi Declarations* (World Wildlife Fund [WWF] 1986) in which five of the world's major religions stated quite categorically their interpretations of the human-nature interface, and the human role in the scheme of things. The Christian statement mentioned the ethics of St Francis, who in his "Canticle of Brother Sun" called all creatures his brothers and sisters, and who was submissive to all creatures, scanning the creation attentively, listening to its mysterious voices. Such transcendentalism is quite radical for mainstream Christianity, but the fact that it was mentioned in that context is significant. The Christian statement ends:

> "Christians repudiate:
>
> all forms of human activity - wars, discrimination, and destruction of cultures - which do not respect the authentic interests of the human race, in accordance with God's will and design, and do not enable men as individuals and as members of society to pursue and fulfil their total vocation within the harmony of the universe;

> all ill-considered exploitation of nature which threatens to destroy, and, in turn, to make man the victim of degradation.
>
> In the name of Christ, who will repay everyone for good works, Christians call upon all men and women to pursue:
>
> a synthesis between culture and faith;
>
> ecumenical dialogue on the goals of scientific research and on the environmental consequences of the use of its findings;
>
> the priority of moral values over technological advances;
>
> truth, justice and the peaceful co-existence of all peoples" (WWF, 1986, p. 14-15)

The Green Paradigm in Asian Thought[8]

It must be stated quite clearly at this point that the Green Paradigm does not depend on any `alternative' or `mystical' thought patterns for its existence. Indeed with regard to Asian traditions of thought, the notion of a paradigm shift would be something completely alien; it is an inherently Western concept, a product of a Western philosophy of science. Since there is even dispute about whether Asian thought traditions constitute philosophies, or whether a philosophy is by definition limited to Western systems of thought; it would be completely incorrect to attempt to justify a Western paradigm shift by using Eastern evidence.

Having said that, it does, nevertheless, remain interesting to speculate on similarities which may exist between the Green Paradigm and some of these Asian systems. The temptation to do so has been there almost as long as the pressure for a new environmental perception; reaching a peak in the late nineteen sixties and early seventies. The practice has become quite common, with varying degrees of success. Books with titles like *The Tao of Physics, The Tao of Science,* and even *The Tao of Pooh* are readily available. This suggests that while justifying the Green Paradigm through Asian thought may be unnecessary from the point of the internal coherence of the Green Paradigm, there is still pressure to do so from other sources. Many of the pioneer physicists who worked in areas such as relativity and quantum theory themselves speculated and wrote genuinely mystical papers - among them Einstein, Schroedinger, Planck, Heisenberg, Eddington, Pauli, and Bohr. This is not to say that they found their fields of research mystical, far from it. In every generation people have tried to use physics to both prove and disprove religion, but the dangers of this are

8 I would like to thank Prof. R.T.Ames for his assistance with this section.

obvious - when fashions in physics change, where does that leave the religion? (Wilber, 1985). Schroedinger put this more bluntly:

> "Physics has nothing to do with it. Physics takes its start from everyday experience, which it continues by more subtle means. It remains akin to it, does not transcend it generically, it cannot enter into another realm" (Schroedinger, 1957, p. 204).

Any attempt at identifying Green ideas within Asian thought is thus very difficult, perhaps put of proportion to the reward. It becomes an exercise in comparative culture and philosophy, an exercise which has a number of caveats of its own. There are two opposing positions on the validity of such an exercise; on the one hand is the feeling that when all is said and done all people, East & West, are similar; a feeling counterbalanced by a perception of fundamental differences between Westerners and Easterners. The idea that the problems tackled by thinkers are universal, and transcend cultural differences is counterpoised by the contention that apart from superficial similarities, there are profound differences that are the result of culture-bound ways of living and thinking. Where some feel that failing to regard the common characteristics as important is to deny other peoples their humanity, others feel that to assert the dominance of such a community is deny the different cultures the full value of their uniqueness (Callicott & Ames, 1989). It is a very important debate; on the one hand these positions can lead to intellectual system-building and reductionist universalizing, as elements of one culture are squeezed and pruned to fit a mould endemic to and derived from another. On the other hand it can equally lead to a kind of xenophobia, an uncritical parochialism of arrogance and isolationism.

A second caveat stems from the common habit of combining what are many - and often competing - thought systems under some generic title like `Eastern Thought'. Simply put, there is no general Eastern wisdom of a type of coherence exhibited by Western philosophy; Asia itself is a large and very diverse place - far more so than the European cradle of Western philosophy - and possesses a commensurate diversity of thought systems. Within these systems it is possible to find systematic philosophies with strong rationalist elements; `Eastern philosophies' which fit without force into the categories derived from the assumptions and presuppositions upon which the Western rests. The later Mohist logicians of classical China, the Nyana logicians and grammarians of India; these are representatives of what could be called an Eastern philosophy (Callicott & Ames, 1989).

Such a philosophy is something of a counter-current in the East. Where Western philosophy has typically sought to identify and categorize as a means of organizing and understanding experience, Eastern systems have sought understanding through analogical similarities. In other words, where Western thought has extracted things from their background in order to understand them, Eastern thought (to generalize it as such, the caveats notwithstanding) examines the background for clues to the particular thing. For the major components of Eastern traditions, order manifests itself in the harmonious arrangement of particulars; there is a significant resistance to abstract notions which rest on universal principles like system, objectivity, uniformity, and unity. It is these characteristics which unify the Western tradition:

> "What makes things clear in the distinctly Eastern mode of thinking, on the other hand, is often an effectively focused image, not a theory; an inexpressible and inimitable experience, not an argument; an evocative metaphor, not a logically demonstrated truth. The aesthetic sense of coherence more typical of Eastern philosophical reflection fosters a pluralism in Eastern philosophies that is not present in the same degree in the Western tradition" (Callicott & Ames, 1989, p. 15).

It may be useful to illuminate this logical/aesthetic distinction with an example, drawn from classical Chinese thought, and shared by, among others the Confucians and Taoists. A common observation of classical Chinese thought is that the Chinese were inclined to see life more as an art than a science. Such classical thought held a `this-worldly' concern for the concrete details of immediate existence, which was used as a basis for generalities and ideals. The starting point was an acknowledgement of the uniqueness and importance of the particular person and the particular historical event, with a simultaneous appreciation of the interrelatedness of the person or event with the immediate context. This is of course not to suggest that Taoism and Confucianism were in broad agreement - they are in many ways opposites; Confucius being a positivist, Lao Tze a mystic; Confucians worship culture and reason; Taoists reject them in favour of nature and intuition (Yutang, 1948). The ongoing attempt by Chinese scholars to reconcile the two has been less than successful, resulting in the saying that every Chinese gentleman is a Confucian when he holds official power (Confucius was the father of the Chinese civil service) and a Taoist when he returns to private life (Foster, 1987).

The essential difference between the opposing extremes of order - logical and aesthetical - consists in the primacy of the abstract in the logical construction, opposed to the primacy of the concrete (particular) in the aesthetic (Ames, 1986). There are noticeable similarities with Lovejoy's categories of `other-worldliness' and `this-worldliness' discussed above.

Ames (1989) contrast the features of the logical and aesthetic constructions thus:

> "1) The logical construction begins with a preassigned pattern of relatedness, a `blueprint' wherein unity is prior to plurality as determinative of the construction.
>
> 2) It registers concrete particularity only to the extent and in those respects necessary to satisfy this preassigned pattern, and will permit of substitution by any particular that can satisfy these same conditions.
>
> 3) Given that it reduces the particular to only those aspects needed to illustrate the given pattern, it necessarily entails a process of formal abstraction, moving away from the concrete particular toward the universal.
>
> 4) It constitutes an act of `closure' - the satisfaction of predetermined specifications - and hence is describable in a quantitative terminology of completeness.
>
> 5) Being characterized by necessity, it limits creativity to conformity, and renders novelty defect.
>
> 6) `Rightness' in this context refers to the degree of conformity to the preassigned pattern."

On the other side of the discussion, the aesthetic composition is characterized by the following features:

> "1) It begins with the uniqueness of the one particular as it collaborates with other particulars in an emergent complex pattern of relatedness, and as such, will permit of no subjunctions: plurality is prior to unity and disjunction to conjunction.
>
> 2) It takes as its focus the unique perspective of a concrete, specific detail revealing itself as productive of a harmony or an order that is expressed by a complex of such details in their relationship to one another.
>
> 3) Given that it is concerned with the fullest disclosure of particularity for the emergent harmony, it necessarily entails movement away from any universal characteristic to the concrete detail.
>
> 4) It is an act of `disclosure' - the achieved coordination of concrete details in novel patterns that reflect their uniqueness - and hence is describable in the qualitative language of richness, intensity, etc.
>
> 5) In that it is not determined by pre-assigned principles, it is fundamentally anarchic and contingent, and as such, is the ground for optimum creativity, where creativity is to be understood in contradistinction to determination.

6) `Rightness' in this context refers to the degree to which the insistent particularity of the detail in tension with the consequent unity of these specific details is self-evidently expressive of an aesthetically pleasing order" (Ames, 1989, p. 116-117).

Having said all this, and having acknowledged that paradigmatic change in Western science can in no way be justified or supported by Eastern mysticism; on the grounds that these are areas which simply do not overlap, certain parallels are nevertheless interesting. The Assisi Declarations of 1986 (WWF) contain formal statements on the human-nature relationship from two of the main Eastern ethical systems, Buddhism and Hinduism. In concluding the Buddhist statement, the Dalai Lama is quoted as saying:

> "Various crises face the international community. The mass starvation of human beings and the extinction of species may not have overshadowed the great achievements in science and technology, but they have assumed equal proportions. Side by side with the exploration of outer space, there is the continuing pollution of lakes, rivers, and vast parts of the oceans, out of human ignorance and misunderstanding. There is a great danger that future generations will not know the natural habitat of animals; they may not know the forests and the animals which we of this generation know to be in danger of extinction" (WWF, 1986, p. 7).

The Buddhist statement also comments:

> "... many have held up usefulness to human beings as the sole criterion for the evaluation of an animal's life. Upon closer examination one discovers that this mode of evaluation of another's life and right to existence has also been largely responsible for human indifference as well as cruelty to animals, not to speak of violence in today's world. On sober reflection, one can find that there is a striking similarity between exterminating the life of a wild animal for fun and terminating the life of an innocent fellow human being at the whim of a more capable and powerful person. We should therefore be wary of justifying the right of any species to survive solely on the basis of its usefulness to human beings" (WWF, 1986, p. 5)

Similarly the Hindu statement on nature comments:

> "Not only in the Vedas, but in later scriptures such as the Upanishads, the Puranas, and subsequent texts, the Hindu viewpoint on nature has been clearly enunciated. It is permeated by a reverence for life, and an awareness that the great forces of nature - the earth, the sky, the air, the water and fire - as well as the various orders of life including plants and trees, forests and animals, are all bound to each other within the great rhythms of nature. The divine is not exterior to creation, but expresses itself through natural phenomena" (WWF, 1986, p. 17-18).

consumption and destruction of industrialisation. It was an expression of freedom, emphasizing the unique and the individual, which was one of the mainstreams of romantic thought.

Much has been made of the romantic rejection of rationalism and the enlightenment, and emphasis placed on romanticism as a reaction *against* material society (Pepper, 1984). This is certainly true; but it was more than simply a response, it was based on ideals of its own. For example, Pope, who predated but in many ways anticipated the romantics, commented on human arrogance upsetting the scheme of things. His *Great chain of being* from *Essay on Man* (1733-4) introduces the connectedness of systems with systems, wholes with wholes.

> From Nature's chain whatever link you strike,
> Tenth or ten thousandth, breaks the chain alike.
> And, if each system in gradation roll
> Alike essential to th' amazing Whole,
> The least confusion but in one, not all
> That system only, but the Whole must fall.
> Let Earth unbalanc'd from her orbit fly,
> Planets and Suns run lawless thro' the sky;
> Let ruling angels from their spheres be hurl'd,
> Being on Being wreck'd, and world on world;
> Heav'n's whole foundations to their centre nod,
> And Nature tremble to the throne of God.
> All this dread ORDER break-for whom? for thee?
> Vile worm!-Oh Madness! Pride! Impiety!

The picture Pope paints is obviously hierarchical, fitting as it does into the prevailing religious interpretation of the period. Although this particular interpretation had lost favour over time, particularly in Green thinking, a number of Pope's other considerations remain relevant, and informed romantic thought. Examples would be the interconnectedness of things, human potential to disrupt a celestial and earthly order through its own impetuosity, and an awareness that people form a part of the systems. In some ways Pope's interpretation is an early holism.

The romantics maintained that science was inadequate to explain all the phenomena of life, and they regarded these phenomena (which were to be understood through intuitional, instinctive and emotionally-based knowledge) as the most noble aspects of being human.

In a letter to Rev. Wrangham dated October 1794, Samuel Taylor Coleridge commented:

> " ...but where Justice leads, I will follow - though the Path be through thorns and roughness - The Scotts desire their Compliments. *Compliments!* Cold aristocratic Inanities! I abjure their Nothingness. If there be any whom I deem worthy of remembrance - I am their

> Brother. I call even my Cat Sister in the Fraternity of universal Nature. Owls I respect and Jack Asses I love: for Aldermen and Hogs, Bishops and Roystone Crows I have not particular partiality - they are my Cousins, however, at least by Courtesy. But Kings, Wolves, Tygers, Generals, Ministers, and Hyaenas, I renounce them all - or if they *must* be my kinsmen, it shall be in the 50th Remove - May the Almighty Pantisocratizer of Souls pantisocratize the Earth, and bless you and
>
> S.T. Coleridge!"
>
> (Coleridge, 1981, p. 239-240).

The romantics rejected the reductionism of the Cartesian dualism; for them subjective knowledge of, and one-ness with, Nature, expressed through art, was a superior form of knowledge to the objective, empirical, and coldly-calculating classical science. For the romantics, nature had an integrity of its own. Qualities which Newtonian science rejected as secondary (e.g. colour, beauty, grandeur, and taste) products of the human mind were accorded the status of primary characteristics (along with length, breadth, height, etc) by the romantics. By what right and what logic, they asked, can people recognize some characteristics and not others? All are equally important, whether they are measurable or not. Humans possess the ability to relate to nature in a very intimate way, but if they were removed, nature would carry on being what it was (Pepper, 1984). In many ways the romantics' search for meaning in Nature, and their recognition of the interconnectedness of wholes is a theme which runs throughout Green thought.

The American Transcendentalists and the Land Ethic

The transcendental romantic ideal is still prevalent in the United States of America today, in the form of a professed national love for `the outdoors'. Sunshine, clear air, sparkling rivers, and the grandeur of the forests and mountains inspire a national pride, and are in large part responsible for the continued migration of people to the Sunbelt and the West coast. The ideal exists in a state of perpetual conflict with the other great American urge; growth, sometimes cohabiting uneasily in the minds of individuals. The frontier ethic of imagining the wild country to be a moral vacuum in need of civilization and cultivation was common, and was an interpretation favoured by supporters of the DWEP. Even so, many of those who had intimate contact with the wilderness came to reassess this perception; frontiersmen like Daniel Boone began to sense that wilderness possessed aesthetic values, and values beyond human calculation. The frontier ethic remains strong today, even thought the frontier closed toward the end of the last century. The aesthetic perception is even today frequently seen to offend free enterprise, civic pride, and the spirit of true independence (Pepper, 1984).

It was exponents of the aesthetic (or esthetic or even esthetik as they sometimes spelled it) viewpoint, notably Henry Thoreau, John Muir, Waldo Emerson, Walt Whitman, and Aldo Leopold who publicized the peril of the wilderness, ultimately leading to the National Parks movement. In most of these `transcendentalists', an aesthetic appreciation of the value of Nature was not at all antagonistic to a spirit of scientific investigation. Theirs was not a reductionist, intrusive sort of investigation, rather a collection of bold data, a revelling in the complexity and fecundity of nature. It was a natural ethic in itself; Nature was worthy of reverence in its own right and not only if of economic value. Thoreau, whose 1854 account of life on Walden pond contains detailed description of the form and movement of the lobate sands which make up the pond's banks, as well as documentation of plant, bird, and animal species encountered, also says in the same book:

> "The constant enquiry, which nature puts is `Are you virtuous? Then you can behold me.' Beauty, fragrance, music, sweetness, and joy of all kinds are for the virtuous." (1906a, IV, p. 80).

For the transcendentalists like Thoreau, contact with nature was an absolutely essential part of being human; it was not possible to reach one's full human potential without it. Thoreau was, however, an intensely practical man. He wanted to be virtuous in order that he could perceive beauty; and apart from that beauty which lay in God's nature, the highest lay in the simple, economical, and poetic life of the practical individual whose actions were directed toward experiences with the truth, the goodness, and the beauty present in nature. This, for Thoreau, was salvation (Metzger, 1961).

> "He alone," said Thoreau, "is the truly enterprising and practical man who succeeds in maintaining his soul here" (Thoreau, 1906b. VI, p. 213-214).

For Thoreau the main problem with society was that it had not been set up to allow for the salvation of a practical person like himself, and to this end he retired to Walden Pond in order to achieve a communion with nature by means of an economy of living.

> "To be a philosopher is not merely to have subtle thoughts, nor even to found a school, but so to love wisdom as to live according to its dictates a life of simplicity, independence, magnanimity, and trust. It is to solve some of the problems of life, not only theoretically, but practically" (Thoreau, 1906b, II, p. 57).

For Thoreau and the other transcendentalists, science had a role and a place in the world, but it was as tool, not as model.

> "... as it is important to consider Nature from the point of view of science, remembering the nomenclature and systems of men... so it is important often to ignore or forget all that men presume that they know, and take an

> original and unprejudiced view of Nature, letting her make what impressions she will on you.... For our science, so called, is always more barren and mixed up with error than our sympathies are" (Thoreau, 1906a, XIII, p. 168-169).

The *Land Ethic* of Aldo Leopold, although unfortunately never fully articulated by him, is a formalization of much of the spirit of the American transcendentalist into a more concrete structure[9]. Having spent much of his life as a Forest Ranger, Leopold became increasingly convinced of the need for an extended system of ethics which would incorporate more of the land. A result of his concluding that all ethical systems rest on the principle of an individual being a member of a community, his land ethic sought to enlarge the boundaries of that community. The community came to include the land: the soils, the plants, the waters, and the animals (Leopold, 1949). Leopold argued that the human community is to a large part founded on the mutual security and economic interdependence, which is preserved by limits on freedom of action; ethical constraints, in other words. The biotic community exhibits a similar interdependence, with plants and animals occupying their niches, and the entire system relying on interdependence. Human potential for impact on the land has grown tremendously, and unless mediated by some similar constraints on action, could physically destroy the land. A land ethic is therefore an ecological necessity. For Leopold it was also an evolutionary possibility - he felt that as members of the biotic community, humans possessed a moral response to the land, and would respond if they saw it to be threatened. Put simply:

> "the key to the emergence of a land ethic is, simply, universal ecological literacy" (Callicott, 1988, p. 296).

In this context the land ethic can be seen as resting on three scientific cornerstones. In the first instance evolutionary theory provides the conceptual link between ethics and social organisation. It encourages a sense of some sort of kinship with fellow creatures, in that they are fellow voyagers in the odyssey of evolution. Although it is arranged differently, we are all made of the same stuff.

Secondly, ecological theory provides the concept of community; the sense of integration of human and non-human nature. Human beings, plants, animals, soils, and waters are all interlocked in one humming community of co-operations and competitions, one biota.

Finally, the Copernican revolution, and more recently photographs from space, placed the Earth in an incredibly vast and empty space. For some this contributes, even if only subconsciously, to a sense of kinship, community, and interdependence with

9 For a fuller discussion of this particular issue, see J. Baird Callicott's *In Defence of the Land Ethic*. I would also like to thank Prof Callicott for his assistance and interest.

fellow denizens of the Earth household. The ecological movement worldwide received a well documented boost in support following the publication of photographs of Earth taken from space; a cozy and fragile island paradise in a dark and hostile desert (Callicott, 1988).

The land ethic, in other words, changes the role of humans from being the conqueror of the land community to simply being a fellow-citizen of it. It implies that there should be a respect for other members, and equally a respect for the community in itself (Goodpaster, 1978). For the transcendentalists, there was more to nature than there seemed at first to be; and the same was true of life. They sought a goal, an ultimate experience of life, and found it in the natural handiwork of God. For them, life, in communion with nature, was the road to salvation (Metzger, 1961).

There is a wealth of ideas and of examples of transcendentalist support for what are here called Green ideas; their notions of democracy, for example, which overlap considerably with those of Kropotkin; or their perspectives of ecology, which contain a critique of the scientific method which is close to that offered by feminism; or even their ideas of the impact of urban structures on the mental health of the inhabitants, critiques which are truly geographical, even more so than most conventional geography. All these are germs of ideas which together produce something more.

Kropotkin's Anarcho-Communism

Crown Prince Petr Kropotkin (1842-1921) was a Russian geographer and anarchist. As a social scientist one of his goal was the creation of a more fulfilling society where the individual was not frustrated and dehumanized by large-scale mass organization, and where relationships of domination and hierarchy were replaced by mutually supportative and freely accepted relationships between people. As was the case with Marx and Engels, Kropotkin's motivation was primarily social, and an alleviation of human misery; the ecological imperative was secondary. Such a human-oriented component is an essential part of a change in human thought, however, and is frequently left out of the ecological debate in Western circles. Nevertheless, Kropotkin documented extensive observations of natural communities, from ants to apes, bushmen to birds, and concluded that if there was any one feature common to all of them, it was the mutual aid between members of the community (Kropotkin, 1904).

Anarchists have given themselves, and perhaps even more, have been given, rather bad press. One thinks of the bitter little person in Conrad's *The Secret Agent*, inhabiting a gloomy twilight world of hatred and despair, exorcising his frustrations and insecurities by lobbing a few arbitrary bombs. It is hardly an attractive or endearing picture. It also has absolutely nothing to do with anarcho-communism. Anarcho-communism:

> "...sometimes called decentralized or libertarian socialism... rejects the contention of individualist anarchism that personal freedom is more important than, or incompatible with, social responsibility .... Anarcho-communists recognize the essential interdependence of personal autonomy and community. Enrichment and growth of the human personality are seen to depend on an identification of each individual with the interests of the larger group which supports personal freedom, fosters egalitarian cooperative relationships, encourages diversity and impedes the emergence of hierarchies of authority or power.... The critique of existing society overlaps with Marxism in its abhorrence of repressive class relations and the inevitable inequities which flow from capitalism and other forms of economic exploitation" (Breitbart, 1979, p. 1).

Anarcho-communists attack centralization, hierarchy, privilege, and domination, whether they be within capitalist or socialist structures. It is a spirit which is very close to the original frontier ethos of the American West, a spirit of freedom, interdependence, and close co-operation which existed before increasing pressure undermined the element of friendly cooperation and replaced it with the (individualistically Anarchistic) competitive self-centredness of the late 20th Century. The Anarcho-communist spirit remains alive and well, and was certainly a major component of the rejection of the Socialist bureaucracies which has swept Eastern Europe. Green groups are becoming the new opposition to the old order in the Soviet Union, Hungary, Poland, and Yugoslavia. These Green groups are something new within existing socialist systems, because the people are acting, not as members of classes, but as citizens. It is not dictatorship of the working class that the environmentalists are pursuing here, but the democracy of civil society and the emancipation of the citizenry (Redclift, 1989).

Kropotkin derived much of his inspiration from observing an anarchist community which existed in the Jura Mountains. It consisted of a group of artisan watchmakers who had begun an anarchist organisation, the Jura Federation. From this and other ecological observations, Kropotkin concluded that much of the emphasis placed on `survival of the fittest', and `competition' as methods of evolutionary selection was inappropriate. What struck him, time and again, was the degree of cooperation which existed in Nature. This, it seemed, was of far greater importance to survival than the competitive element, and yet was seldom, if ever, mentioned[10]. For Kropotkin and other anarcho-communists, the domination and exploitation of nature by humans was simply an extension of the domination of humans by other humans. The logical extension of this line of thought is that if domineering and exploitative human

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10 At this point one should, perhaps, recall the feminist critique.

relationships can be avoided in human societies, then such societies would have the most harmonious human-nature relationships (Pepper, 1984).

> "What is anarchy? It is `life without masters,' for society as well as for the individual, with social harmony deriving not from authority and obedience or from law and penal sanctions, but from the free association of individuals and group, according to the needs and interests of each and all. He who commands becomes depraved, he who obeys becomes smaller. Either way, as a tyrant or as a slave, as an officer or as an underling, man is diminished. The morality which is born out of the present conception of the State and the social hierarchy is necessarily corrupt" (Elisee Reclus, 1892, in Dunbar, 1979, p. 16).

A central organizing principle to be found in Kropotkin's (1899) *Fields, Factories, and Workshops*[11] is the satisfaction of human needs through the minimum use of energy. An emphasis is placed on `humanizing' labour - durability of goods and craftsmanship, a combination of hand and brain work, and a system which creates work where people live and does not force them to congregate in cities, nor require capital intensive technology. Like Schumacher's (1973), it was an economics as if people mattered. There is an understanding in anarchist thought that self-actualization is important; that it is a need, and that it is not predicated on accumulating money. Instead there is a genuine understanding of the real social meaning of development. It is not more laws which make a country more developed, but fewer.

Malthus and the Scarcity Debate

It was Thomas Malthus who during the late eighteenth century earned for economics, particularly political economics, the epithet `the dismal science'. His *Essay on Population* (1789) was written to refute utopian dreams, and although people had previously observed and commented on human population growth, Malthus' was the first `scientific' discussion of the implications. Based on his experiences of the poverty and social upheavals of industrialisation, the Rev. Malthus formulated his famous ratios. He claimed that at best, food production could increase only arithmetically (1:2:3:4:etc), but populations would increase geometrically (1:2:4:8:etc). It was therefore apparent to him that the population must eventually outstrip the available resources. Malthus predicted that this would lead to a frantic wage war to meet rising prices, and to the eventual starvation of those unfortunates who had drawn blanks in the lottery of life (Malthus, 1789).

For Malthus this was a fateful cycle, decreed by God. As with many other species, the Creator had endowed humans with a reproductive capacity far in excess of

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11 When this was edited in 1974 the editor added *(Tomorrow)* to the title indicative, of the degree to which Kropotkin was ahead of his time.

the ability of the soil to produce food. Expansion, as a necessary function of the human fertility, would be followed by the misery of competition, and then finally collapse. The cycle would then begin again. Malthus saw the industrial revolution as an inevitable outcome of the curse laid on the species. As the population increased, so the rural landscape must necessarily give way to an increasingly urban one. Even if people should return miraculously to the garden of Eden, they would soon be back in their precarious state, because the species was doomed to breed until overpopulation destroyed them.

Malthus refused to accept either the promises of limitless material abundance offered by the factory owners, or the return to a rural order, since both solutions ignored the problem of human sexuality (Worster, 1977). He saw divine reason in the curse, however. It was there to spur humanity on in a ceaseless and never-ending struggle to avoid the final collapse. Had people never been faced with the threat of starvation, they would long ago have relaxed into slothful savagery. Only the continual fight drove them towards increasing civilization; a goal Rev. Malthus saw as having divine sanction.

Malthus' prediction was the subject of many attacks in later years. He seemed to regard human reproduction as a given constant, for example, and did not appear to grant people any sort of control over the number of children they had. He was seeking a natural law, and seemed not to countenance any deviation from it, for whatever reason. Population was controlled only by outside checks; war, starvation, disease, etc. It was the same with all species - only the natural checks such as predators kept elephants from overrunning the earth; or flies, or mice, or any species. He failed to acknowledge that a change in circumstances of a society often has an impact on the birth rates - even though such data were available to him (Pepper, 1984). Similarly, he failed to acknowledge the huge capacity for technology to increase yields or have an impact on either population or food supply. Nevertheless, his was a note of caution in an optimistic age, and one which is in some respects still valid.

Neo-Malthusianism is a term which covers not only those who stress the validity of Malthus' contentions in modern society, but also those who have arrived at similar conclusions through their own scientific research. The now famous 1972 *Limits to Growth* study by Meadows and Forrester of Massachusetts Institute of Technology reached similar conclusions to Malthus'; and critics even called it `Malthus with a computer' (Freeman, 1973).

Some Neo-Malthusian add a new dimension to the debate. They include in the misery of poverty and starvation the devastation of pollution associated with excess economic activity and large numbers of people striving for high living standards

(Pepper, 1984). The majority of these studies occurred in the late sixties, when there was a strong Neo-Malthusian swing, but are even more relevant in the present context, where pollution has become a global concern. The threats of climate change, ozone reduction, and acid pollution make a mockery of national borders and policies and reinforce with avengance the idea that the world is an interconnected whole.

As with most theories, there is always the possibility of taking assumptions and drawing incorrect, or ideologically laden, conclusions from the assumptions. Neo-Malthusianism has gained a well deserved reputation for this sort of thing. Two of the better known Neo-Malthusian of the late sixties were Paul Ehrlich and Garrett Hardin. Ehrlich was a proponent of Zero Population Growth, and became notorious for his demands for compulsory birth control (Ehrlich, 1968, Ehrlich & Ehrlich, 1970). Hardin was to gain equal, if not greater, notoriety with `the lifeboat ethic'. In *The Tragedy of the Commons* (1968) Hardin, quoting Malthus, stated that a finite world can only support a finite population, and that population growth must eventually equal zero. Once this condition is reached, there are two reasons why Bentham's utilitarian goal of the greatest good for the greatest number (the aim of neoclassical economics) cannot be realized. In the first place it is not possible mathematically to maximize two or more variables simultaneously. In the second place, the biological limits of available energy (food) would mean that to maximize population, people would have to do away with non-essential energy use - dancing, reading, singing, running - anything which used up more energy than was simply necessary to live. Such a lifestyle is hardly to be considered the `maximum good'. The optimum population must therefore be less than the maximum (Hardin, 1968). If the assumptions about limits to population growth are questioned - in other words, are there limits, and if so what are they? - then the world is faced with a situation in which limitless growth of population can endanger the access to resources of all people. Hardin (1968) argued that there were no natural limits since no human family was so dependent on its own resources that if it were to grow too large, some members would starve to death. Humans are social animals, and the increased demand would be spread across society, lowering the overall standard by small stages with each new birth. A planet committed to a welfare state mentality was dooming itself. Instead, Hardin argued for "mutual coercion, mutually agreed upon". Applied globally it would mean massive campaigns to reduce population growth. It could also mean leaving those who were starving, to starve.

Such an approach is obviously unpopular. It is elitist, technicist, arrogant, and cold-blooded. It remains an approach to a problem, however, and does not detract from the validity of the problem. There has been an unfortunate conflation of this proposed solution and the problem, often leading to individuals who appreciate Malthus' insights being labeled misanthropes. The fact remains that it is not possible for the population to continue growing indefinitely. Although at present there is sufficient food to feed the world's population - it is simply inappropriately distributed (Lappe & Collins, 1977) - this food production is done at enormous cost in terms of energy and take-over of other ecosystems. Any increase in the population must eventually require a commensurate increase in food production (assuming that the distribution problems are solved. Present food production is land efficient (in terms of production per unit area), but is energy inefficient (production per unit energy input). High energy input farming is less sustainable than low. While the planet may technically be able to feed double or triple its present population, one must ask at what cost in terms of energy, ecosystem take-over, and extinction of other species. One must also ask to what end, and what ultimate benefit of the planet and the human species.

The question of scarcity must surely be a central one not only to Green thinking, but to conventional environmentalism and indeed conservation itself, that great-grandparent of this line of thought. If everything were limitless, there would be no need to conserve, and we could quite happily continue in the direction of the DWEP, or at least its Marxist interpretation, confident that once the problems of distribution are sorted out, there will be more than enough of everything for everyone.

This debate is often carried out under the heading of entropy (e.g. Georgescu-Rogen, 1976; Rifkin, 1980), and as such it is not uncommon for people to equate the entire question with that of whether there will be sufficient energy for the continuation of the production process. At this point critics normally note either a) the energy input from the sun is to all intents and purposes limitless, and entropy is therefore not a problem, or b) before long we will have perfected fusion, and entropy will therefore not be a problem. For example:

> "Evolution proceeds by creating local order out of chaos. The second law of thermodynamics is irrelevant because the earth is an open system, receiving energy from the sun and disappating it into space, and the second law only applies to closed systems" (Fitch & Upper, 1988, p. 39).

This is the interpretation frequently taken by evolutionists. It is flawed. `Entropy' is the Greek equivalent of the Latin `evolution', and was introduced into nineteenth century thermodynamics to mean simply that over time different regions of the universe become more and more alike in their mean energy levels, implying that less and less work can be done by their interaction. The kinetic theory of gases and statistical mechanics reinterpreted this theory to mean that the kinetic energy of molecules in any one defined region of space would have the same distribution as any other region of space because the connection between the regions would lead to randomization of molecules and the redistribution of energy through collisions. This has been incorrectly interpreted to mean that all molecules would have the same kinetic energy, rather than collections of molecules having the same distribution of energies. In addition to this, gravitational and electromagnetic energy have been confused with kinetic energy, and a picture of the universe decaying in to an equally spaced, formless, orderless final state has been produced. It is hardly surprising that evolutionists, seeing increasing complexity and order, have concluded that organic evolution negates entropy (Levins and Lewontin, 1989). Having concluded this, it is equally unsurprising that evolutionists see entropy as irrelevant, a point which can be taken to extremes by Neo-Darwinists and sociobiologists. In fact, whatever else it does, evolution must accord with the entropic changes in the physical universe. In their present condition, living organisms use the differences in kinetic energy between regions as a source of energy for their own reproduction, but in doing so they contribute to the increase in entropy. Without free energy life cannot exist, and it remains constrained in its evolution by the limitations of thermodynamics (Levins and Lewontin, 1989).

The direction or appropriateness of the production process receives little attention as long as people are assured it will have the power to continue indefinitely. There are, of course, problems with even this most simplistic level, such as the ability of the planet to absorb the excess heat which fusion would generate, or even the waste heat from the consumption of electricity, ignoring that produced in the power stations themselves - if present trends in the USA continue, within 100 years this heat will approximately equal the heat produced by insolation in the USA, which will clearly stress the heat tolerance of the planet (Summers, quoted in Goldsmith, 1972), but these specifics need not concern us, since there are more fundamental problems with the assumptions.

Rifkin (1980) notes that if the rate of use of the ten leading minerals continues to increase at a growth rate of 3%, within several hundred years the production process would literally mine the equivalent of the world's weight. On a planet over four billion years old, and for a species with a recorded history of several millennia, that is not a particularly long time. The planet is of finite size. That is the ultimate limit. If it is all mined there is no space for forests and deserts and tundra, let alone cities and people.

Economists frequently argue that substitutability implies that there is no absolute scarcity; if something runs out, a substitute will be found and all will be well. This is not necessarily so. In terms of the requirements for a good and healthy human life, things like fresh water, fresh air, safe and pleasant surroundings, and the opportunity to `get away from it all' whenever necessary, the scarcity is absolute. This distinction is sometimes made by economists in terms of Malthusian and Ricardian scarcity. Malthusian scarcity is absolute, Ricardian is relative (Barnett & Morse, 1963).

Malthusian scarcity was reviled by Marx in its original form, and too many scholars have simply adopted Marx's attitude without giving the issue sufficient thought. Marx may in fact have confused two things; the fact that absolute scarcity does exits, and the proposal put forward by Malthus (Lee, 1989). In fact in later editions of his famous essay on population, Malthus actually acknowledged that possible checks on population which involved changes in behaviour, rather than famine, war, and other drastic effects of overpopulation might be available.

Even so, the point which Malthus was making is that absolute scarcity exists - space for food production is physically limited, and attempts to squeeze more production out of the land ultimately run in to the Entropy law, and end up consuming more energy than is produced. In the long term such attempts generally result in the destruction of the productive capacity of the soil. Technology which allows cultivation of more and more marginal land frequently destroys that land. For example, centre-pivot irrigation systems can be used on very bad soil in all kinds of areas. Yet instead of increasing yields, more land is taken out of production as a result of these systems than is brought in, because the fragile balance of marginal land is disrupted very quickly. After a season or two, the land becomes too salty or is leached of its minerals to the extent that it will not even support its original vegetation[12]. Soil erosion and desertification follow in many instances. Similarly `improved' strains of high yielding crop varieties are often more susceptible to pests, disease, or climatic conditions, and, while they may produce more under ideal conditions, require increased energy input and are less tolerant to stress than many lower technology strains (Conway and Barbier, 1990).

Ricardian, or relative, scarcity argues that while there may be a scarcity of a particular resource, or of a particular quality of a resource, there is never an absolute scarcity because there is always more of the resource available, even if it is of a lower quality, and that even if the resource should run out, it is always possible to find a substitute which is not scarce (Barnett & Morse, 1963).

Substitutability is the key to the Ricardian analysis. Yet substitutability necessarily presupposes the availability of appropriate technology which can produce and deliver the resource. Such technology is not always available, as in the above example of land used for crop production. Yet increasingly economists and politicians pin their hopes for the future of their nations on a faith in the ability of science and technology to deliver the goods, (a process which reciprocally forces a research agenda on science). This faith in the power of science to complete the `liberation' of human

12 Andrew Goudie in a lecture to the Geography Dept at UCT, 1989.

from nature is simply a logical progression of the assumptions of the DWEP. Statements like:

> "Man (sic) has probably always worried about the environment because he was once totally dependent on it" (Fisher and Peterson, 1976, p. 21)

and:

> "Advances in fundamental science have made it possible to take advantage of the uniformity of energy matter - a uniformity that makes it feasible, without preassigned limit, to escape the quantitative constraints imposed by the character of the earth's crust. A limit may exist, but it can be neither defined nor specified in economic terms. Flexibility, not rigidity, characterizes the relationship of modern man (sic) to the physical universe in which he lives. Nature imposes particular scarcities not an inescapable general scarcity. Man is therefore able, and free, to choose among an indefinitely large number of alternatives" (Barnett & Morse, 1963, p. 11),

are simply examples of the misplaced optimism of the nineteenth century, and should be banished from the debate entirely. While it is certainly possible to substitute one energy source for another, and equally to substitute one material for another, this does not logically lead to the conclusion that humans are not dependent on Nature, nor that there is no absolute scarcity of low entropic energy and matter. Since neither energy nor matter can be created, no matter how sophisticated our tools become, we cannot `liberate' ourselves from a dependence on Nature. Substitution may delay the final reckoning of resource depletion, but it does not alter the state of absolute scarcity. More than that, in the increasing sophistication of the tools of substitution may lie the need to use more energy, and ultimately speed up the entropy process (Lee, 1989). The `burn the rocks and dredge the sea' attitude to resource depletion is completely unrealistic and unworkable, to say nothing of unhealthy. It should be consigned to the limitless reaches of science fiction and left there.

If one of the goals of humanity is the reproduction of the species, and if it is true that a) the faster low entropic energy and matter is used up, the shorter will be the duration of our species; and b) technology is unable to overcome the depletion of low entropic energy and matter, and indeed higher technologies may speed up the process of depletion, then there is a strong argument for the diversion of resources from ecologically insensitive technologies to ecologically sensitive ones (Lee, 1989). Given the social constraints on technology direction presented in the first section, this suggests a need for an ecologically sensitive social system and social philosophy. It strongly suggests a new research direction for geography.

Malthusianism, Neo- or otherwise, has been used loosely in this section to cover aspects of what is often referred to as the `limits to growth' debate (e.g. Daly, 1987, Benton, 1989). This over-simplification is potentially problematic. Much of the criticism of Malthus, for example that by Marx and Engels, focused on his failure to appreciate the human capacity for action and adaptation (Benton, 1989). It is, however, possible to acknowledge this capacity, and still remain concerned about the existence of limits to the carrying capacity of the planet - this would seem to be a feature of Neo-Malthusianism, as opposed to pure Malthusianism. It is a mistake to conflate the two, as is often done (e.g. Randall, 1987), and assume that because humans undoubtedly do have a capacity to adapt, there are no limits to the carrying capacity of the planet - these are separate debates and should be thought of as such. The issue of ultimate limits is problematic in itself, in that it is often treated as a fine line; a point up to which things are satisfactory, and beyond which they are not. Economists and science fiction writers frequently point out that it is possible (theoretically) to extract all that human society requires from bare rock (e.g. Randall, 1987), and use this to claim that, since there is no shortage of rock in the universe; there are no limits to growth. This rather naive approach would be better replaced with a notion of trading off. Turning the world into a single giant city might be technologically possible, but that requires trading off numerous species of plant and animal, as well as wilderness and solitude, which many might feel are as necessary to human health as food and which from even a purely anthropocentric point of view do not constitute the `maximum good'. This suggests that the optimum population is not the maximum population. Every development requires some trade off, and ultimately the limits to growth must be ethical, rather than physical. It is perhaps this idea which is the most valuable contribution of the Malthusian debate. Similarly, while people may theoretically be capable of adaptation, they may be either unable or unwilling to do so. A failure to adapt in the face of a crisis could make Malthus' predictions valid in spite of all their limitations.

The inclusion of Neo-Malthusian arguments here is not an acceptance of the conclusions to which many of them, like Hardin, come. Like the DWEP, the Green Paradigm is a complex framework, and there are other aspects of this framework, such as the rejection of relationships based on power, which would negate the options chosen by Neo-Malthusian. Similarly the inclusion should not be seen as an intimation that Neo-Malthusian are Green; most of them are patently not. Rather it is that the questions which are posed by Malthus and by the concept of a Malthusian scarcity are central ones in the development of the Green Paradigm. Asking the same questions is not synonymous with coming to the same conclusion. It is that the questions posed still require answers, and geography is perhaps in a better position to attempt some of them than most disciplines, assuming it can shake the DWEP as its framework of analysis.

Marxism and Social Criticism

Marxism is, primarily, a conception of society and a tool for analyzing how society works. It is a system which has never been correctly implemented as a working model for society, and the rearrangement of the nominally `Marxist' Eastern Europe has been long overdue (Redclift, 1989). Although this rearrangement is often referred to as the `fall of communism', or `the fall of Marxism' it was in fact neither, for the simple reason that the systems were neither Marxist nor communist, in spite of what they may have claimed. Burgess (1978), for example, lashed out at the `idiocies of the Stalinist approach' in the USSR, particularly in its crude approach to nature.

As in the case of the previous section, the inclusion of Marxism in this chapter is not a suggestion that Marx was Green; he patently was not. Nor is it a contradiction of the inclusion of Marxist Economics in the previous chapter. Rather it is a recognition that the two paradigms are based on interpretations and on different answers to what are fundamentally similar questions. Equally it is a recognition that many of the questions posed by Marxists and other theorists of social justice with regard to exploitation, equality, justice, and power are equally questions which are fundamental in the development of the Green Paradigm. The difference is that the Green alternative goes further in its formulation of these questions, and extends these concepts to the non-human world. This does not mean that the conclusions drawn about the distribution of power *between* humans by non-Green social theorists is necessarily incorrect. Much of it is directly useable in the construction of a Green Paradigm. Green thinking provides a different framework within which social theorists can ask their questions, and it provides a new depth to the range of answers which are possible; a depth which is not available under the DWEP. The distribution of power between human agents has played a significant role in the development of the DWEP. Quite simply, it will not be possible to implement a new cultural paradigm without drawing on much of the wisdom accumulated in radical social theory. Questions like the issue of redistribution have been heavily debated by social theorists, and would need inclusion in a politically mature Green Paradigm. Yet as a caveat against the uncritical adoption even of Marxian analysis, the differences between this perspective and the Green one are drawn out. It is the questions, not so much the answers, which makes radical social theory an integral part of the development of the Green Paradigm.

For Marxians humans act socially, not just mechanically (Sayer, 1979). This implies that their actions have meanings, and are not simply behavioral responses. If people fight or argue, shop for new clothes, vote, or get married, it is because there are meanings attached to these actions. They do not exist in a vacuum. Crude, mechanical explanations of society fail to recognize the importance of the meanings of actions; in other words they fail to appreciate the human intention behind them. As a result of this failure people and their environment are treated merely as objects, reduced to data which can be used to produce technical evaluations of their relationships, both between themselves, and between humans and nature. Behaviour is reduced to positivistic cause and effect relations, and the reasons for the behaviour are ignored (Pepper, 1984). Neoclassical economics, for example, operates on very simplistic assumptions about human motivations. Similarly much of the Malthusian spectre of limits to growth denies the possibility of humans adapting their actions to suit changing conditions; one of the key reasons for the Marxian critique of Malthus (Benton, 1989). Marxian analysis is an extremely powerful tool for understanding the complexities of the reasons for actions. Human actions and motivations are complex, and it follows that any system which attempts to adequately explain such features is likely to be complex in itself. An understanding of some of the concepts used in Marxism is therefore necessary[13].

Marxism is, firstly, a materialist concept of history rather than an idealist one. What this means is that for Marx it was not the introduction of new ideas which changed society, but the change in the processes by which society maintains itself. It was thus important to understand the material processes which operated, how society interacted with nature to subsist, a process called *labour*. Labour shapes society, and it shapes nature. It also shapes the people who are doing the labour. It is a material process which shapes history - this material organisation is called the *mode of production*. This is not to imply that Marxism believes the world consists only of material things; on the contrary, for Marx it was the spiritual and philosophical aspects of people that separated them from nature. Marxism is a humanist approach which sees people as subjects and not objects. Marxism rejects the perception that mind and thought are reducible to material processes. As a materialist perception Marxism suggests that it is not sufficient to merely change people's values and priorities, it is necessary to change the way they relate to nature (Pepper, 1984).

It is apparent that Marxism does not simply slot into the Green Paradigm; indeed many of its perceptions may be in opposition to some of the Green ones. Like feminism, Marxism is at its strongest as a critique. Where feminism informs us that the personal is political; that one's personal perspectives affect one's actions and values,

13 This can naturally be no more than a cursory introduction. There are many accessible texts available, for example *The Beginners Guide to Marxism* (unfortunately banned in South Africa), and from an environmental perspective, David Pepper's *The Roots of Modern Environmentalism*, from which much of this introduction is drawn.

Marxism informs us that society is a complex of interconnected relationships and organizations based in a particular history.

One of the concepts of Marxism which is most relevant to the Green Paradigm is that of *alienation*. Marx, when examining the industrial capitalism of the late nineteenth century, criticized it for its dehumanizing aspects. Labour was so divided that individual labourers had little affinity for the finished product - someone whose job consisted of tightening wheel nuts, for example, might not care if they were working on a Rolls Royce or a Ford, or a tractor. People were becoming nothing more than extensions of machines. At least in part as a result of Marx's critique, such dehumanizing labour is less common in the First World today. Much of it has been replaced entirely by machines or farmed out to more desperate workers in the Third World.

While such alienation from the product is of concern to many ecocentrics, of more direct concern is the fact that agribusiness has alienated people from nature. Farms require far fewer labourers if they are mechanized (although they require greater energy from other sources, e.g. petrochemical), and the labour of even those who remain on the farms is frequently compartmentalized to the extent that they feel little affinity for the final produce. Meaningless work alienates the worker from themselves, as work is unrelated to life, except in providing money. For the owner of the business, the labour a worker can supply becomes more important than the worker - labour becomes a commodity, and the worker becomes an object.

Just as significantly, centralized government alienates the individual citizens from the process of government and from control of their own society and their own lives. This is a criticism which could equally be aimed at the `socialist' states of Eastern Europe and Asia. A centralized government tends to govern in its own interests rather than anyone else's.

For Marx liberation came through an individual's regaining control of their own lives and labour. He felt work should be a process of self-realization, rather than simply a means of keeping alive. One would produce products of use to others in the community, shaping nature to create socially useful products where the individual could exercise their artistry and creativity. Marx's ideal then is a particular sort of communism, similar to that of the anarcho-communists, although few details of the workings of this ideal were provided by Marx (Benton, 1989). He rejected the crude version of communism, inspired by universal envy, negating all culture in a levelling down (McLellan, 1979). Marx's humanism is one which sees a harmony between human and nature; nature is used for human society, but not exploited. It is argued that if land is an asset of the whole community, society will not produce the deserts capitalism does (Pepper, 1984). Of course the problem is that this ideal, while it does exist in the writings, is a very small part, and comes nearer the beginning than the end, leading many to suspect that Marx changed his mind about his ideal society and rejected these conceptions as utopian and unrealistic. Certainly, as was demonstrated in the previous chapter, this attitude to Nature formed no part of any working `Marxist' system.

Marx was very much a student of state structures. He was particularly struck by the extent to which the laws of a nation reflect the interests of those in power. If such a critique is correct, it indicates that there may be severe restrictions on the amount of environmental reform permitted under any government, if power groups find such reforms threatening. This is in contrast to the perception which would see ideas as having the power to cause great changes. This interpretation can be extended to the role of geography and science in dealing with ecological problems. Elements of social criticism are important in understanding the position of geography in science, and of science in society. Ecological problems are not just event which need to be `tackled' or `combatted', they are social processes which need to be understood.

The actual perception of nature of Marx and Engels is a complex one. Engels, for example, quotes pages of instances where human alterations of nature have produced unforeseen secondary or tertiary consequences. He commented:

> "...we are reminded that we by no means rule over nature like a conqueror over a foreign people, like someone standing outside nature - but that we, with flesh, blood, and brain, belong to nature, and exist in its midst, and that all our mastery consists on the fact that we have the advantage over all other creatures of being able to know and correctly apply its laws" (in Parsons, [ed] 1977, p. 68).

Engels' faith in human abilities to understand nature is a common feature of the Marxist approach. It has been called the `Promethian spirit of the late nineteenth century', in which neither Marx nor Engels saw ecological factors as being a limit to human potential (Redclift, 1989). There was a recognition that actions had ramifications which could not be foreseen or dealt with, but there was an underlying optimism that suggested a hidden caveat, `yet'.

Nature is accorded a greater significance within the Marxian perception than the capitalist, being seen as an integral part of people. The importance of the dialectical approach to nature, in which humans transform nature, and are in turn transformed by it, has been stressed (Parsons 1977). Nevertheless the strength of the Marxist critique, namely its humanism, is also a weakness in the context of the present Green revolution. In his famous quote:

> "The cleanly weeded land, and the unclean human weeds...are pole and counterpole of capitalist production" (Marx, *Capital*, 1, p. 696)

Marx recognizes the human impact on the land, but does not recognize the potential of nature to create a change in social structure. As with neoclassical economics, value in Marxism is determined by humans, specifically by the amount of labour they expend on an object. Nature's value is its value to people. This is not to suggest that Marxism sees people as above nature. Engels specifically sees human thought as a natural product:

> "But if the further question is raised: what then are the thoughts and consciousness, and whence they come, it becomes apparent that they are products of the human brain and that man himself is a product of Nature, which has been developed in and along with its environment: whence it is self-evident that the products of the human brain, being in the last analysis also products of Nature, do not contradict the rest of Nature but are in correspondence with it" (Engels, *Herr Eugen Dubring's Revolution in Science*, p. 42-43).

And Marx himself:

> "Just as plants, animals, stones, air, light, etc., constitute theoretically a part of the human consciousness, partly as objects on natural science, partly as objects of art - his spiritual inorganic nature, spiritual nourishment which he must first prepare to make palatable and digestible - so also in the realm of practice they constitute a part of human life and human activity. Physical man lives only on these products of nature, whether they appear in the form of food, heating, clothes, a dwelling, etc.. The Universality of man appears in practice precisely in the universality which makes all nature his *inorganic* body - both inasmuch as nature is (1) his direct means of life, and (2) the material, the object, and the instrument of his life activity. Nature is man's *inorganic body* - nature, that it, in so far as it is not itself the human body. Man *lives* on nature - means that nature is his *body*, with which he must remain in continuous interchange if he is not to die. That man's physical and spiritual life is linked to nature means simply that nature is linked to itself, for man is a part of nature" (Marx, *The Economic and Philosophical Manuscripts of 1844*, p. 112).

It is certainly an awareness which is amenable to that of the Green Paradigm, yet in relation to much of the other writings, it often appears as if the conflation of human and nature has created the impression that nature is human, rather than the reverse. Matter, for Marx, which is independent of labour, has no value:

> "The purely natural material in which no human labour is objectified to the extent that is merely a material that exists independently of labour, has no value; as little value as is possessed by the common elements as such" (Marx, *Grundrisse*, p. 366).

Two strands of the theoretical perspectives of Engels and Marx are particularly problematic to the Green perspective. Firstly, through their critiques of Malthus, they rejected as necessarily conservative the arguments of natural limits. Although they recognized that capital accumulation was subject to outer limits, it was felt that these limits were generated internally by the contradictory social relations of capitalist economies. Secondly, in spite of their critique of the morality of capitalism, Marx and Engels held an optimistic view of its historical contribution to preparing the ground for future human emancipation. Industrialization, fostered by capitalist economic relations, was seen as a precondition for the future communist society (Benton, 1989). There is, however, potential for transcending these limitations, and a great deal of work is being done in this area. Benton (1989), for example, suggests reconceptualizing Marxian arguments within a framework which grants explicit theoretical recognition to the labour performed by natural processes as an attempt to move away from the perspective that natural processes hinder human emancipation.

It is no more correct to judge Marxism in the course of a few pages and through a few selected references than it would be to judge any other huge body of literature in a similar manner. Marxism contains valuable insights, particularly insofar as it gives an indication of the socially constructed environment. The concentration on the material conditions of existence is a *this-worldliness*, an approach grounded in things as they really appear to be, which can inform the Green Paradigm, particularly in its application to changing societies. Like Smuts, Marx was also a product of his time, and many of the now obsolete ideas of the nineteenth century crop up in the writings. While this does indicate caution in the use of Marxism, it does not detract from its value as perhaps the only internally coherent, and most complete, scientific instrument for the study of society.

Ecology and Darwin

Ecology is obviously intimately linked to the Green Paradigm. It was the science of ecology which brought to the attention of the general public the interconnected nature of Nature. Modern ecology has, however, been so completely assimilated into the sciences that it is becoming increasingly reductionist and abstract in its application, studying ever smaller pieces of systems, a trend which has been labeled a perversion of the idea (Goldsmith, 1988b). Nevertheless, ecology possess a very strong holistic history (Odum, 1953; Worster, 1977), and it is this particularly that has informed the Green Paradigm[14]. Similarly, under the influence of Neo-Darwinists, evolutionary theory has become mechanistic and reductionist, placing undue and

14 Again, this section can do no more than introduce some of the key points in the history and application of ecology. For a more comprehensive examination, see for example Anne Bramwell's (1989) *Ecology in the 20th Century: a history.*

unnecessary emphasis on random gene mutations and on natural selection, and ignoring the feedback system between the organism and the environment. This too is a corruption of a valuable idea, and requires further examination.

The term `ecology' was first used in 1866 by Ernst Haeckel, in his book *Generelle Morphologie*. When he coined *Oekologie* he was referring specifically to the web that linked organisms and their environment. Ecology saw organisms in their context; their life cycle, their environment, and their places in the energy cycle (Worster, 1977; Bramwell, 1989).

From the beginning ecology was more than purely biological. The very word has overtones of the Greek *Oekonomie*, derived from *oekos*, the household unit, to describe its proper functioning. Again bearing in mind the Greek concept of good, it was as self-sufficient as possible, avoided waste and disorder, and was applicable to a group, rather than on an individual basis. Ecology was also used co-terminously with ethnology, the study of animal behaviour (Worster, 1977).

In the late nineteenth century a group of North American zoologists began to observe birds in their natural habitat, an idea which shocked conventional zoology. They suggested that in order to understand the true meaning of animal behaviour, it was necessary to observe it in context. There was a strong negative reaction to the idea, at least in part because the scientific method relies on a control group and an experiment group. It is difficult to carry out a controlled experiment in natural conditions - instead such a situation would require an imaginative and empathetic attitude (Bramwell, 1989). While the idea never really found favour with zoology, it remained an important part of ecology, and stressed the importance of systems and context.

Ecology lends itself more to description than definition.

> "Ecology concerns itself with the interrelationships of living organisms, plant or animal, and their environments; these are studied with a view to discovering the principles which govern the relationships. That such principles exist is a basic assumption - an act of faith - of the ecologist. His (sic) field of study is no less wide than the totality of the living conditions of the plants and animals under observation, their systematic position, their reactions to the environment, and to each other, and the physical and chemical nature of their inanimate surroundings..." (MacFayden, 1957, *Animal Ecology: aims and methods*, cited in Kormondy, 1976, p. xi).

Ecosystems are not static entities. Two of the major processes they perform are the movement of energy and of nutrients, which involve interaction between the biotic and non-biotic components of the environment, and which include homeostasis, adaptation, growth, development, change, and evolution. In these two processes, the movement of energy is unidirectional and non-cyclical, while the transfer of minerals is a cyclical one. Energy is ultimately derived from the sun, transformed in to chemical energy, and flows up the food chain from plants to carnivores, with some energy being lost at every step. On the other hand minerals which are used by living organisms ultimately return to the soil through excretion or death and decay, thus completing the cycle.

Ecosystems can be described as self-organizing systems. They display five essential characteristics. 1. They are capable of self-maintenence and self-regeneration which enables them to maintain their integrity under a variety of circumstances like changing environmental conditions and other forms of interference. 2. The existence of 1. implies the presence of a dynamic stability, which is achieved by the fact that they are open systems, continually exchanging matter and energy with their environments. 3. Since an ecosystem is composed of a number of interdependent variables each of which moves between an upper and a lower limit, the ecosystems themselves are in a state of continual fluctuation which may be described as homeostatic (Lee, 1989). 4. In the event of an external disturbance the ecosystem corrects the imbalance through a system of negative feedback, which may operate at a variety of scales, from the correction of chemical imbalances to the regulation of populations ((Kormondy, 1976). However:

> "While the basic assumption that species (in an ecosystem) replace one another in a successional gradient `because populations tend to modify the physical environment making conditions favourable for other populations until an equilibrium between biotic and abiotic is achieved'... is certainly valid, it may be an oversimplification" (Odum, 1953, p. 257-258).

5. In addition negative feedback is not the only mechanism for self-organization available. Positive feedback consists in amplifying certain deviations rather than damping them, and plays a crucial role in the processes of learning, development, and evolution (Capra, 1982). This process of amplifying small initial deviations may transcend the existing systemic boundaries and enable the emergence of new levels of structure, and even new systems (Lee, 1989). For example the process of freeze-thaw weathering may, after a while, create a crack in a rock large enough to support a system which contains rock, soil, flora and fauna. Negative feedback loops have been characterized as deviation-countering, while positive feedbacks are deviation amplifying, and may lead to self-transcendence. Both are examples of mutual causation processes, in other words non-linear causation models (Maruyama, 1963, in Lee, 1989). This is a vital difference between ecology and sciences dominated by the

Newtonian cause-effect model[15]. In ecological studies it is held that the properties of ecosystems cannot be predicted from the individual properties of the biotic and abiotic components. The entire planet, not just the biosphere, including ecosystems and their interactions, is governed by its own sets of laws, as a unity. Ecology attempts to find these laws. From this Holism can be drawn the principle of interdependence (Lee, 1989).

> "Everything within any ecosystem one chooses to examine can be shown to be related to everything else. Moreover, there are no linear relationships; every effect is also a cause in the web of natural interdependency. Of course, not all relationships are equally important or equally sensitive, and most of them are indirect. In general, however, interdependence is total" (Ophuls, 1977, p. 21).

The implication of this is that the removal or the addition of an organism or of an inorganic substance can have impacts throughout a system, and that the impacts may be beyond our capacity to predict; indeed this is more likely than accurate prediction. There is a strong similarity between this model and the model of chaos theory which is discussed later in this chapter. Both suggest that the impact of insensitive human actions on their environment may have significant consequences which are to all intents and purposes unpredictable.

Much of Haeckel's ecology was developed on foundations laid by Darwin, just as Darwin was influenced by reading Malthus. Although Social Darwinism and many other fields have made the competitive element of Darwin's evolution primary; the bedrock of his theory, although he never isolated it as such, is that all survival on Earth is socially determined (Worster, 1977). The interpretation of nature as being `red in tooth and claw' exists in Darwin's work, and he makes much of survival of the fittest, but it is at all times tempered by an awareness that Nature is a web of complex relations, and no individual or species can live independently of that web. Within the web were the places, the niches - Darwin even called them offices - the feeding role of the organism, and the pattern of its behaviour. Such places were not fixed or immutable, and at any time an organism could have its place usurped by a more capable one. Such competition was always within the confines of the web, however, and implied that even the most insignificant creatures are important to the welfare of conjoining species and the web as a whole. They are either essential members of society, have been at some period, or have yet to be (Worster, 1977). This awareness survives today in the call to preserve biodiversity.

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15 Notwithstanding the fact that not all ecologists have transcended the mechanistic approach to the study of life

The intricacy of relations is a dominant theme throughout much of *Origin of Species*. Darwin remarks how plants and animals, although remote on the scale of nature, are nonetheless bound together by the web of complex relations. He illustrates the point by describing the relationship between cats and flowers: cats affect the number of mice in an area; the mice affect the bees, by destroying combs and eating larvae, and the bees, through pollination, affect the number of flowers (Pepper, 1984).

In his *Descent of Man*, the title of which is revealing of his attitude to his contemporary perception of human superiority, albeit a book which sees Europeans at the top of an evolutionary tree, Darwin attempted to demonstrate that there was an inner *moral*, as well as an outer *physical*, continuity among all species. Shame, wonder, curiosity, reverence, and magnanimity are all qualities which originate in lower species, as do social instincts and moral sense. Darwin explained all these virtues in utilitarian terms, since he felt that they all contributed somehow to the survival of the individual and the continuation of the species. Even so, he felt Nature was a world held together by a system of mutual love and sympathy; and even if these qualities occurred only in the most rudimentary form, they still suggested that there was more to nature than violent aggression. He saw in Nature justification for a belief that moral behaviour evolved to a peak in human civilization. Just as art had evolved from the ancient struggle for survival to be elevated to something greater, so morality evolves to be more than merely useful. In its highest incarnation it becomes a self-transcending sense of mercy, sympathy, and kinship with all animal existence, including the Earth itself. Only when people have reached the capacity to feel for all things, will they have become truly civilized (Darwin, 1871). The problem with this perspective of Darwin's is that it was formulated and contextualized within the ideology of the period, and is to a significant degree an extrapolation of his social norms on to the rest of nature, one which has been eagerly siezed upon by his followers and his successors. Yet a sympathetic reading of Darwin, one which accepts and can take in to account the distortions imposed on his analyses by his society, can reveal a sensitivity to interconnections and to the planet with which it is not popular to credit him. Indeed his theory emerged towards the end of a long battle between `science' and Fundamentalism, and was a significant contribution to the side of science. It is interesting to speculate whether this may have led Darwin to place more emphasis on the mechanistic side of his theory than he might otherwise have done.

Much of Darwin's original sensitivity has been lost in the emergence of Neo-Darwinism. Yet while there have always been thinkers who rejected Neo-Darwinism, it is only recently that the theory has come under such concerted attack (Ho & Saunders, 1984). The essence of Neo-Darwinism is a reductionism which sees random mutations of genes being naturally selected through competition, leading to evolution. This seems not to be necessarily correct, many mutations are `neutral' as far as natural selection goes, conferring no particular advantage on the organism; an awareness which arose from the observation that the rates of amino acid substitution in proteins are nearly constant during evolution (Kimura, 1968). The observation that there are too many electrophoretic variations in natural populations than can be explained by natural selection (Harris, 1966; Lewontin and Hubby, 1966) supports the assumption of neutral mutations. The logical conclusion which must be drawn from this is that the majority of genetic variations have no physiological or phenotypic consequences, and indeed that the disparity between organic and genetic evolution is so great that it suggests an effective decoupling of the two (Ho & Saunders, 1984). The observation that humans and chimpanzees, which are biologically so different as to belong to different families, but which are 99% identical in their genes (King & Wilson, 1975) is perhaps the best known example of this. Not surprisingly these developments led people to question the theory of evolution based solely on genes. In addition to this, work on the fossil record fails to provide evidence of a continuous series of intermediates existing during the transformation between species; a requirement in the Neo-Darwinan approach (Eldredge & Gould, 1972). These fundamental problems have led some to attempt to transcend the Neo-Darwinian framework. In doing so they have begun to examine issues ignored by Neo-Darwinists; questions of determinism and direction in evolution, the origin of biological form and function, and the global patterns of speciation and extinction which were either regarded as irrelevant or as explicable by natural selection have been reconceptualized as primarily to evolution and thus epistemologically prior to natural selection. Under a common goal of explaining evolution by necessity and by mechanism, without resorting to the contingent and the teleological, accidental variation and selective advantage, which are the primary categories of Neo-Darwinist explanation, have been relegated to last resort explanation (Ho & Saunders, 1984).

> "Once we go beyond the restricted framework of Neo-Darwinism there is no need to deny our biological heritage, nor do we need to shun the study of such characteristically human attributes as mind. Artificial intelligence allows the exploration and illumination of natural intelligence. It provides a description of the mental process which is irreducible to molecules and detailed mechanisms; thus emphasizing the richness and the subtlety of that process.
>
> But mind, like organism, arises epigenetically. The social environment enters as formative influence into development. Perhaps human freedom and uniqueness lie precisely in that responsibility for an environment in which our species can develop and evolve" (Ho & Saunders, 1984, p. 11).

The emerging alternative to Neo-Darwinism is not a theory, a title Neo-Darwinism feels free to claim. Instead it is more of a way of approaching problems than it is a solution. It embodies an acceptance that different aspects of evolution may require different explanations, and rejects the idea that natural selection of random variations in genes is sufficient and necessary to account for all evolution. It rejects the mechanical causality and the physico-chemical reductionism of Neo-Darwinism as simply being inadequate. This is an important point; the move towards alternative explanation is just the latest in a long line of increasingly sophisticated answers to questions which people have been asking throughout recorded history; how the organisms we see around us came to be, and why they are as they are. Originally these questions were answered by reference to the supernatural. Out of this arose a movement dedicated to finding a scientific explanation, and for many this explanation was completed by the postulation of natural selection. Reflection revealed inadequacies in this, where the properties which shaped organisms were seen to be different to those shaping the inorganic. Dogmatic adherence to natural selection as the only evolutionary force led to more and more creative attempts to explain `traits' in terms of selective advantage, in spite of both `traits' and `advantage' being almost impossible to define. In the end explanation in terms of natural selection came more and more to resemble explanation by reference to the deliberate design of an omnipotent Creator. Instead the notion of evolution by process seeks to return the field of evolution to the process Darwin and Lamarck began (Ho & Saunders, 1984). Evolution by process is based in the premise of the unity and rationality of nature, seeing organism and environment interconnected from genes to social institutions. As a result of the interconnections the organism is both affected by its experiences, and in return actively creates and structures its environment. There is a process of mutual transformation which is neither random nor arbitrary, rather the transformations proceed according to the organizational principles which apply equally to the organic and inorganic world (Ho & Saunders, 1986).

> "Evolution by process accords with the empirical findings of science, and with our deepest experience of nature. In emphasizing integration and intelligibility, it re-establishes a fertile and harmonious relationship between biology and the exact sciences on the one hand, and between biology and the social and human sciences on the other"(Ho, 1988, p. 141).

Quantum Theory, Relativity, and the Green Paradigm

Of all scientists, it is perhaps the physicists who are most concerned with the nature of reality. It is thus particularly interesting to find that so many quantum theorists have rejected the Cartesian dualism and sought a new way to describe what their studies have shown reality to look like (Wilber, 1985). Nor is this perception of reality limited to a description of the physical universe - reality is linked to consciousness, and thus to some of the most fundamental problems facing humanity. Under the DWEP the human consciousness is perceived as fragmented. This fragmentation originates in a kind of thought which treats things as inherently different, disconnected, and broken up into yet smaller parts. Such a thought pattern will inevitably lead the individual to defend their own Ego against that of all others, a defence justified as many things within the DWEP: masculinity, natural selection, or normal conflict. It will prevent humans from recognizing common dangers, and from working towards a common good. Similarly, even if an individual recognizes a kinship with humanity on some sort of criteria, human needs will then be perceived as distinct from the needs of nature. There is at present no coherent world view which can accommodate both the scientific and societal need for a non-fragmented world view (Bohm, 1980).

The danger at this point is the blurring of the boundaries between physics and everything else; of suggesting that physics can provide a model for a perfect world. This is emphatically not the case, nor is it what is so important about the revelation of the new physics. Indeed in spite of a personal acknowledgement of the mystical union between subject and object (Wilber, 1985), Shroedinger commented:

> "... the pulling down of the frontier between the observer and observed, which many consider [a] momentous revolution of thought, to my mind seems a much overrated provisional aspect without profound significance" (Schroedinger, 1954, p. 8).

Instead what is significant about the new physics is that for the first time physics was forced to confront the idea that it was not working with reality, but with an abstraction. For Sir James Jeans:

> "The essential fact is simply that *all* the pictures which science now draws of nature, and which alone seem capable of according with observational fact, are *mathematical* pictures.... They are nothing more than pictures, fictions, if you like, if by fiction you mean that science is not yet in touch with the ultimate reality. Many would hold that, from the broad philosophical standpoint, the outstanding achievement of twentieth-century physics is not the theory of relativity with its wedding together of space and time, or the theory of quanta with its apparent negation of the laws of causation, or the dissection of the atom with the resultant discovery that things are not what they seem; it is the general recognition that we are not yet in contact with the ultimate reality. We are still imprisoned in the cave, with our backs to the light, and can only watch the shadows on the wall"(Jeans, 1931, p. 111).

Physics, in other words, does not deal with reality, but with shadows. The value of the new physics lies in making this patently obvious. To go beyond the shadows is to go beyond the realm of physics, which may be what led many physicists to mysticism; the awareness that physics pointed to something wider of which it was a small part (Eddington, 1929). If physics does not deal with reality, then reality must by definition be metaphysical. The search for meaning, which characterizes many of the roots of the Green Paradigm, could thus be understood as a search for reality.

Quantum theory is at the leading edge of this struggle for a new world view. In its attempt to examine the behaviour of the most basic elements of matter - those things out of which everything else is constructed - it immediately runs into a challenge. If it uses the assumption that the universe consists of tiny particles, it faces the problem that the particles are also manifest as waves, that they move discontinuously, and that there are simply no laws at all which apply in any useful detail to predict the actual movement of individual particles. In fact only statistical generalizations about large numbers of such particles have any predictive ability. Similarly, if the assumption that the universe consists of waves is used, it is similarly undermined by the occasional particular behaviour of matter.

Most people, physicists included, ignore the issue entirely, contenting themselves with the development of mathematical models which can describe the behaviour of large aggregates of matter. Increasing division of labour in society, which is reflected in increasing specialization in academia, allows people to regard the whole question as `someone else's problem'. Those aspects of relativity theory and quantum theory which suggest that the Dominant Western Environmental Paradigm is inadequate tend to be de-emphasized and regarded as mathematical problems rather than as indications of the real nature of things. Most physicists cling to the atomistic concept of matter, the hope that there are little building blocks out of which everything is made[16]. Such an attitude is even more common in other sciences, like biology, meteorology, and even psychology. The attitude is understandable, because it allows things to be understood in more or less mechanical terms.

The attitude is also inadequate. To attempt to follow the path of an atom is to venture beyond the realms of ready comprehension. It is an action with little meaning; the atom is as much a wave as it is a particle, and it depends for its form on the observer. If one tests for it to behave as a particle, it will be a particle; if one tests for a wave it will be a wave. There is some direct and inseparable connection between the

16 If this statement sounds unduly harsh toward physicists, consider the point that it was made by David Bohm, himself a Professor of Theoretical Physics at London.

observer and the observed - they are merging and interpenetrating aspects of a whole reality, a reality which is indivisible and unanalyzable (Bohm, 1980).

Relativity also presents difficulties for the classical perception of the atom. Einstein said that no signal could travel faster than light, because this would break down the electromagnetic waves that held it together. This also implies that a universe constructed of rigid basic objects is not possible. Instead it is necessary to view the world as a flux of events and processes.

Although they approach the question for different angles, both quantum theory and relativity imply the need to look upon the world as an undivided whole. Atomism is correct and valid only insofar as in spite of the undivided flowing wholeness of matter, various patterns can be abstracted which have relative stability and autonomy. It does not affect the ultimate description of reality, but is, by its nature, abstract.

It may be useful to examine in more detail how it is that both relativity and quantum physics undermine the explanatory ability of classical physics. Classical physics relies on a certain basic order and measure to describe things. In this it uses certain Cartesian co-ordinates, and a notion of absolute time which is independent of space. The coordinates are those characteristic of Euclidian geometry, e.g. height, length, and depth (x, y, and z axes). Such a system implies that certain structures are possible, based on a quasi-rigid body as the constituent element. A classical structure is thus analyzable into separate parts; parts which work together as a machine. The laws of physics describe how the parts relate to each other, and any external disturbance can be treated as a cause which will have a specific effect on the system (Bohm, 1980). The snooker table is a good analogy; if all the initial positions and velocities are known, the final outcome can be predicted.

Relativity raised a problem. One of the basic features of classical physics is that it is possible in principle to overtake any form of motion, as long as the speed is finite. This is not possible with light, since according to the theory as soon as an object travels faster than light its atoms would disperse and it would fall apart as it left behind the electromagnetic field that holds the atoms together. The speed of light, c, is relative, since no matter how fast something goes, light will still pass it at the same speed, whether the object is moving towards it or away from the source of light. No longer could the coordinates be seen as absolute; they were now relative; relative to the speed of the coordinate frame. The speed of light is thus the maximum possible speed of a signal. What this means is that in relativity it is not possible to consistently maintain an extended rigid body, since this would necessitate signals (holding it together) which were moving faster than light. Instead of point particles or quasi-rigid bodies being taken as primary concepts, they have to be described in terms of events and processes.

A structure is thus defined as a *world tube* which exists in time, and within which a complex process of interaction between other smaller world tubes is going on. A world tube is a sort of flow of energy which emerges from a background and eventually merges back into it. Any object is thus a temporary abstraction (Bohm, 1980).

While no-one has been able to obtain a consistent description of such a world tube, it is apparent that the total universe must be regarded as the primary field. In other words, it is necessary to regard the universe.as an unbroken and undivided whole. Any division into particles and fields is at best a crude abstraction and approximation.

Quantum Theory has even more radical implications for the Cartesian notions of order and measure. It introduces four new features of great significance.

1) Quantum action is indivisible. That is to say, the transitions between stationary states are in some sense discrete; the system need not pass through a series of intermediate stages.

2) Matter possesses a wave-particle duality. Depending on the experiment, matter may behave more like a wave, or more like a particle, but it always possesses elements of both.

3) Matter reveals its properties through statistical potentialities. As a result of 2), every physical situation can be characterized by a wave function. Since different experiments will cause matter to react differently (and in ways mutually incompatible), however, this wave function does not describe the actual properties of an object. Instead it refers to the potentialities within the physical situation. The descriptive wave-function is thus a statistical indication of the probabilities of actualization of different potentialities. It cannot predict in detail each individual observation. Where in classical physics it is assumed that it is only the actual state of the system which is relevant in a given physical situation, in quantum theory it is meaningless to talk about the actual state of a system apart from the whole set of experimental conditions necessary to actualize that state.

4) Quantum theory implies non-causal correlations. Experimental observation has revealed that events which are separated in space, and which cannot physically interact, are somehow correlated. Since Einstein's relativity suggests that signals cannot propagate faster than light speed, there is no detailed causal explanation for the phenomena.

What is implied by quantum theory is a very definite wholeness, a unity of everything with everything else. A description of the experimental conditions remains inseparable from the description of what is called the observed object - there is no meaningful separation of subject and object.

> "What is meant here by wholeness could be indicated metaphorically by calling attention to a pattern (e.g., in a carpet). In so far as what is relevant *is* the pattern, it has no meaning to say that different parts of such a pattern (e.g., various flowers and trees that are to be seen in the carpet) are separate objects in interaction. Similarly, in the quantum context, one can regard terms like `observed object', `observing instrument', `link electron', `experimental results', etc., as aspects of a single overall `pattern' that are in effect abstracted or `pointed out' by our mode of description. Thus, to speak of interaction of `observing instrument' and `observed object' has no meaning" (Bohm, 1980, p. 133-134).

Although quantum theory is very different to relativity, they both have in common the fact that they highlight the inadequacies of the physicist's investigation of reality. Such a warning has potential audiences well beyond the scope of theoretical physics, and is valuable in tempering human arrogance, particularly the frequently technological approach of the DWEP. In essence the new physics points out how little, rather than how much, is known.

Chaos Theory

Chaos denies deterministic predictability of dynamical systems. It is thus appropriate that it should follow relativity and quantum theory here, since in their turns these denied the illusions of absolute time and space, and the dream of controllable measurement processes. Chaotic behaviour is a feature of dynamical systems analysis which in essence suggests that non-linear relationships, although unpredictable, are nevertheless stable.

The basic goal of the theory of dynamical systems is to understand the eventual behaviour of an iterative process; in other words it asks "where do points go, and what do they do when they get there?" (Devaney, 1987). Given that the answer to this is a goal of many scientific fields as diverse as metrology, ecology, economics, and theoretical physics, it is not surprising that chaos theory is widely applicable, as well having very diverse roots. Indeed it has been suggested that natural processes are overwhelmingly non-linear. The standard scientific education creates a distorted sense of the world's possibilities; it ill equips the student for the behaviour of even the simplest non-linear system. The increasing sophistication of linear mathematics draws attention away from the fact that linearity is itself an arberration in a non-linear world (May, 1976).

A piece of lore frequently quoted by Greens or other environmental activists, and made popular by Barry Commoner (1972) says "Everything is connected to everything else". While this phrase developed as a result of the growing realization of the interconnectedness of ecosystems and organisms, it is one of the cornerstones of chaos theory. The idea is phrased somewhat differently in chaos language, but there is an intrinsic understanding which remains common. By definition, a chaotic dynamical system possesses a sensitive dependence on initial conditions. This has major implications; if a map possesses sensitive dependence on initial conditions, then for all practical purposes the dynamics of the map can not be computed because small errors of measurement which form the input to the calculation, and which are caused by necessary rounding off, become magnified during the running of the calculation. In other words, the results of the numerical computation of an orbit, no matter how accurate, may bear no resemblance whatsoever to the real orbit (Devaney, 1987).

Interestingly, from a point of geographical trivia, this concept was discovered by a meteorologists. In the early 1960s Edward Lorenz produced a simple weather model, using twelve variables and a computer, and producing a single line graphical output of a chosen variable, for example wind direction. One day, seeking to examine in greater detail a particular sequence, he fed in to the machine initial conditions copied from its own output. Instead of duplicating the conditions, the weather machine produced patterns which started off similar, but which soon diverged until completely unrelated. What eventually transpired was that the output of the machine was displayed to only three decimal places, while the actual calculations were done to six. The difference of less than one part per thousand had produced different conditions. Instead of being assimilated as slight arberrations and averaged away, the tiny difference produced chaos (Gleick, 1988). The implications of chaos were captured by Lorenz in his suggestion that the beating of a butterfly's wing in Brazil could set off a tornado in Texas (Lorenz, 1979); or more topically, massive amounts of carbon dioxide being released in to the atmosphere to produce a totally unpredictable impact at a totally unpredictable moment. Yet in spite of its unpredictability, the chaotic system is stable. It is a complex orbit, locally unpredictable, globally stable, and subject to a set of laws which remain largely undiscovered. Chaotic patterns have been discovered in the atmosphere (Lorenz (1963, 1964) indeed concluded that weather forecasting over any great time period was impossible as a result of chaos), economics (through, among others, an historical record of cotton prices) (Mandelbrot, 1983), and even population ecology through an examination of the records of Lynx fur trappers of the Hudson Bay Company (May, 1976). The implications of the theory are starting to seep in to environmental management (Lucking, 1991), and must surely be crucial for geography. For example, just what will be the result of increasing the amount of CO_2 in the atmosphere?

There are other aspects to chaos theory which are of relevance; ideas like phase space, fractals, and strange attractors (Thompson & Stewart, 1986, Gleick 1988), but they would introduce unnecessary complexity to this argument. What is important from this introduction to chaos theory is that the majority of natural processes are non-linear; that these processes are unpredictable, that they are stable, and that they are sensitive to initial conditions. The world-picture presented by this approach is radically different to the mechanistic, deterministic universe of the DWEP.

Economics and the Green Paradigm

An increasing number of economists are beginning to realize that something has to change in the conventional economic approach to relations with Nature, a point which as noted in the previous chapter. *An Annotated Reader in Environmental Management* (O'Riordan and Turner, 1983) for example, has a chapter entitled "Economics and Ecology: towards a new paradigm?" and specifically raises the question of whether the changes taking place in economics will be enough to cope with the problems, or whether a more radical paradigm shift will be required to incorporate the environmental dimension.

Conventional economics has been based on the assumption that the economy is an open system which is not constrained by any environmental limits in terms of finite resources or limited capacity to dispose of residuals. The concentration on the market process has led to the tendency to regard consumption of goods and services as the final act in the economic system, with resources magically disappearing at that point. The economic system is geared to the maximization of `welfare', derived only from the act of consumption.

Reality is unfortunately rather different; the economic cycle is a closed one; it takes place in the natural environment, from which inputs are drawn and into which residuals are discharged. The conventional system is in fact incompatible with the first and second laws of thermodynamics, which govern material and energy transformations, a point which is widely documented (Christensen, 1987; O'Riordan and Turner, 1987; Bramwell, 1989). The deficiencies of the open system view of economics were noted as early as 1966 (Boulding), when the `cowboy economy' was disparaged, and a methodology which specifically recognized the limits imposed by the laws of thermodynamics called for.

The first law of thermodynamics states that energy-matter cannot be destroyed, it simply changes form; in other words it never leaves the economic cycle. The second states that energy and matter move from states of high availability to low (low to high entropy). Boulding (1966) called for an end to the notion that welfare is maximized by increasing the rate of throughput, and in its place the idea that throughput should be minimized. The ultimate aim of the economic systems should be the maintenance of desirable conditions rather than anything else. What Boulding had described was the `materials-balance' view of economic/environmental articulation (O'Riordan and Turner, 1987). It is also known in various permutations as `biophysical economics', or `energy economics'.

There are two characteristic themes of biophysical economics. The first is the emphasis placed on the physical laws governing production. It is argued by biophysical economists that ignoring such constraints has prevented standard economic theory from being able to fully account for the economic significance of changes in the quality of natural-resource inputs, and in the basic life support systems which are called upon to assimilate the vast quantities of waste resulting from the energy-matter transformations (Cleveland, 1987).

The second theme is the physical interdependence between the factors of production. Neither capital nor labour is capable of producing natural resources; and the supply of capital and labour is thus dependent on inputs of low-entropy matter and energy. In so doing, biophysical economists challenge the `omnipotent technology' model of conventional economics. This hypothesis maintains that depletion of high quality (low entropy) fuel and mineral deposits will not result in a decline in the per-capita material standard of living because such depletion automatically sets in motion other factors which counteract the depletion effect. Central among these is factor substitution, where capital, labour, and resources can be substituted for each other in response to changes in their prices (Cleveland, 1987).

An awareness of natural limitations has been with economics since it began, and was only discarded during the discipline's over-enthusiastic adolescence. Physiocracy is generally acknowledged as the first organized scientific school of economic thought (Neill, 1949), developing in France in the 1750's. Its name literally means `rule of nature'. Physiocrats argued that Natural Law operated quite independently of human agency. Only if humans were to accurately deduce the correct economic behaviour implied by this Natural Law would social welfare be maximized (Cleveland, 1987).

The physiocrats had intuitively grasped the principles of the laws of thermodynamics, which were only formalized in the 19th century. After their formalization they were incorporated into economic theories on several occasions, by Ostwald, who noted that scientific progress was characterized by ever-increasing energy use, and by Podolinski, who attempted to reconcile Engel's labour theory of value with thermodynamic analysis, and who concluded that the socialist model was flawed in that it too assumed omnipotent technology, a fact he communicated to Engels on numerous occasions, and one which Marx and Engels apparently deliberately chose to ignore (Cleveland, 1987; Lee, 1989).

One of the most notable critics of 20th century economics was Frederick Soddy, a Nobel Laureate, who applied the laws of thermodynamics to economic systems, and concluded that any comprehensive theory of economic wealth must have biophysical laws as its first principles. Human life, and indeed capital, depended on energy as the means of production. Energy was not created, however, and society was merely using the stored sunlight of past ages rather than any technological wizardry of its own (Cleveland, 1987, Bramwell, 1989). Soddy concluded that basing an economic system on something as arbitrary as money not tenable in the long run, because the link between money and reality was not a firm one. Money can be created at whim; matter and energy are finite and constant. He also argued strongly against judging wealth on the basis of growth rates since these too are arbitrary human creations and bear little or no connection to the real world. Pursuit of high growth, which is, as was discussed in the previous chapter, exponential, simply for the sake of high growth, is totally illogical (Soddy, 1912; 1926). Interestingly, Muslim fundamentalists too regard interest charges as usury, suggesting that they need not be the focal point of an economic system.

One of the fundamental economic insights on which biophysical economics is predicated was the 1874 observation that the working of an economic system in terms of the types and quantities of goods and services produced resulted in a general equilibrium solution which related all the goods and services simultaneously (O'Riordan and Turner, 1987). Materials balance models, like input-output models, and regional environmental quality models, are all recognitions that economic activity is bounded by constraints other than economic theory. They are all, however, growth-based models which seek to incorporate other variables in order to allow growth to continue.

Some economists reject even these as inadequate, and interpret the biophysical constraints as requiring an entirely new economic interpretation. Daly (1977, 1990) has called for the establishment of a steady-state economy, with a zero-growth in national output. He bases his model on a satisfying, rather than a maximizing, approach to welfare. He stresses the need for people to understand and assimilate concepts like humility, holism, and `enoughness'.

Steady-state economics has some interesting supporters. J.S. Mill wrote:

> "I cannot... regard the stationary state of capital and wealth with the unaffected aversion so generally manifested towards it by political economists of the old school, I am inclined to believe that it would be, on the whole, a very considerable improvement on our present condition"(cited in Daly, 1977, p. 14).

Daly defines a steady-state economy as:

> "An economy with constant stocks of people and artifacts, maintained at some, desired, sufficient levels by low rates of maintenance, `throughput', that is, by the lowest feasible flows of matter and energy from the first stage of production (depletion of low-entropy materials from the environment (sic)) to the last stage of consumption (pollution of the environment with high-entropy wastes and exotic materials). It should be continually remembered that the SSE (steady-state economy) is a physical concept. If something is non-physical, then perhaps it can grow forever, then certainly it is nonphysical.... The steady-state perspective seeks to maintain a desired level of stocks with a minimum throughput, and if minimizing the throughput implies a reduction in the GNP, that is totally acceptable (Daly, 1977, p. 17-18).

There are two key concepts which are inherent in the SSE viewpoint. The first is the rejection of the opinion that capital, in the form of accumulated goods and beings is always increasing, because capital in this sense is a stock, not a flow, and where flows may be endless, stocks must have a physical limit to size. This, in itself, is based on a rejection of what was earlier described as Locke's ontological substitution of money for wealth. If wealth is defined broadly as access to things necessary for a self-fulfilled life, it is apparent that money, while frequently providing this access, can equally deny it. Minimum requirements for a decent life, which must in itself surely be a necessary part of being wealthy are clean air, unpoisoned food, pleasant and safe surroundings, and decent social and family life with a low stress level. The sacrifices necessary to earn a living may mean the loss of all or some of these, which leads one to ask why? Certainly money cannot protect against all the side effects of its own production; nuclear fallout, ozone depletion, and sea-level rise are egalitarian in their impacts. Of course money can provide superficially decent environments to those who have enough of it, but this is at the cost of the genuine wealth of the rest of the population. This is simply the logical extension of the essence of capital accumulation. If it is eternally doomed to seek new products, which by definition must be scarce (otherwise they would be a free good), then it is inevitable that this will ultimately lead to the commodification of everything through limiting the supply. The `good things in life' which used at one time to be free can be commodified either by limiting access - a pay beach, for example, instead of a quiet cove; or by limiting availability - polluted river water would mean the need to buy clean water. Accumulation of money, when taken past a point, is fundamentally in opposition to the creation of wealth. As the goal of an economic system it is rather odd.

The problem is that economists regard needs as requiring fulfillment if the human agent is to avoid harm. Indeed some regard wants in the same category. Yet in this formulation needs (and wants) are culturally determined, and it is difficult to distinguish between them when people start to need things like air conditioners and cellular telephones. A Hindu does not want or need beef; a Jew does not want or need pork, a Jehovah's Witness does not want or need a blood transfusion, even if their life is in danger (Lee, 1989). The wants and needs of Western society have been formulated within the framework of the DWEP, of which conventional economics is a significant part. That these needs should then support the assumptions and direction of the DWEP is hardly surprising; it is a self-fulfilling prophesy. The equation of money with wealth is a facet of the DWEP, as is its status as a need. but that does not make it inevitable or logical outside the framework of the DWEP, nor does it make this position unchangeable. To return to the example of the vegetarian Hindu; the Brahmic caste, who today are guardians of cows were, in Vedic times, great meat eaters and were in charge of sacrificing animals for feasts and to provide food for communities. As a result of deforestation and other ecological changes the land became unable to support the farming of cattle for food. By AD 700 the Brahmins had renounced meat. Cows remained necessary for the purposes of giving milk, pulling carts and ploughs, and providing dung as fuel. They became sacred, the Brahmins their guardians (Lee, 1989).

Genuine human needs are fundamental, they are classifiable, they are few, and they are finite. They are the same in all cultures and in all historical periods; what changes is the form and means by which these needs are satisfied (Max-Neef, 1986). One fundamental need is that for approval and acceptance; a person who is continuously rejected becomes bitter and twisted quite shortly. Approval and acceptance mean conforming, to a greater or lesser degree, to what is expected of one by one's society. If one's social system is predicated on the assumption that power over nature is a good thing to have, and if, through Locke's ontological substitution money can mean wealth, as well as power, it is logical, within the framework of the DWEP, to accumulate money in an attempt to gain approval. Of course giving money away would also gain one approval, but that presupposes a) one has it in the first place, and b) one does not give it all away. Cat Stevens gained less approval by following through with the *zeitsgeist* of the 60s and actually giving up worldly goods to become a Muslim scholar than he did by making millions of dollars singing.

This is an interesting example. On Maslow's (1954) hierarchy of needs, self-actualization is at the top, but is only reachable once more immediate needs like food, shelter, security, sex, and so on have been fulfilled. But following Locke's ontological substitution, the accumulation of money allows possessions to be considered an extension of the self (Lee, 1989), which implies that self-actualization is attainable through the accumulation of possessions. Where Cat Stevens found himself in a position to attempt to self-actualize and did so through the pursuit of internal goals, the DWEP characterizes this as `mystical' or at least a bit odd. Endless accumulation is the more conventional route; the following of external goals. Yet external goals are culturally defined needs and may have nothing in common with genuine needs. It equates satisfaction with Locke's theory of identity based on possession of material goods.

> "To deprive a person of her/his status symbols is to deprive her/him of worth. But... this kind of `worth' is pernicious. So we ought not to build a theory of personal worth, of personal identity and integrity, on such a conception. As its perniciousness centres on (a) its essential competitiveness, (b) its psychic costs both to winners and losers, (c) its entropic costs and all that entails, (d) its interference with the satisfaction that can be derived from a proper appreciation of objects and from cultivating and nourishing human relationships, an alternative account of worth which enters into a more adequate theory of personal identity and integrity must avoid these pitfalls" (Lee, 1989, p. 208).

If one is to attempt to satisfy real and genuine human needs, this should rationally be done according to the following criteria: 1) lowering the demand on low entropic matter and energy, with correspondingly less pollution and waste; 2) relying on actualization of internal goals and goods rather than the possession and consumption of external goods to meet the psychological needs for achievement, acceptance, and entertainment; and 3) the elimination of those satisficers which, instead of assisting people in the fulfillment of a need, actually harm the person - many food preservation methods, for example (Lee, 1989).

Even more radically, Georgescu-Roegen (1976) sees the economic process as a unidirectional entropic transformation. Quite simply, a growing economy, a zero-growth economy, or even a negative growth economy cannot exist forever in a finite environment. If this is the case then there is a strong argument for a significant reduction in energy use, and a need to develop alternative forms just to extend the survival time of the human species.

There are sound economic reasons for the adoption of a Green cultural paradigm, not least of which is that the assumptions made by conventional economics are simply unrealistic. A number of economists have attempted to incorporate solutions to some of the fundamental anomalies of the DWEP in to a workable economic system, and these have had varying degrees of success. This justification, however, while certainly a part of a move toward a Green economics, is not yet *a* Green economics. Nevertheless, it is a step in the right direction; the first part of solving a problem is always recognizing that there is a problem.

Conclusion

The Green Paradigm draws support from a very wide range of sources, and in varying degrees. What does become apparent is that in spite of the great differences in the sources - romanticism and quantum theory spring to mind as an example - there is a great deal of coherence in the shape of the paradigm that emerges.

The paradigm was defined minimally at the beginning of this chapter as implying that the Earth is not centred around the human. From the support, it is possible to add further detail. To return to quantum theory and romanticism; both suggest strongly that it simply makes no sense to attempt to separate human from nature; a position reinforced by economics. The economic criticisms would support the contention of the anarcho-communists that large-scale industrialization is harmful to the individual, and to Nature, and would similarly support the feminist critique in its call for a healthier relationship with Nature, again, with ecology, recognizing the interdependences of human and Nature. A characteristic thread running through much of the supporting material for the Green Paradigm is a sense of a search for meaning. This is by no means a defining characteristic, it is merely an observation that in many instances individuals or groups have recognized that there is more to whatever they were doing than there appeared to be in the first place. Green ideas are frequently associated with, and often conflated with, the `limits to growth' debate (e.g. Benton, 1989). What should be apparent is that the identification of such limits is not a major thrust of the Green Paradigm; since such limits are ethically determined and are thus almost infinitely flexible. Nevertheless, an ethical system based on the Green Paradigm could be expected to see these limits as being much nearer than a system based in the DWEP. Green thinking recognizes that absolute scarcity of things like land, air, and water (among others) exists alongside the relative scarcity created by inequalities.

A second major focus of the developing Green Paradigm is its need to transcend the mechanistic cause-effect model and the reductionism which is so common in science even today. Certainly as explanatory tools these have had their uses, and have in no small way contributed to our present understanding. But our present understanding now points out that alternative explanatory systems are needed. The old models are simply incapable of dealing with the complexities of problems which are encountered in ecology, in climatology, in physics, and in human society.

A third observation is that moving away from a definition of people as the masters of nature removes much of the `legitimation' for social inequality. Racism, colonialism, sexism, militarism, and numerous other expressions of power-centredness are frequently justified, if not overtly, then certainly covertly, by recourse to the human `need' to conquer nature, by the `struggle for survival', and by survival of the fittest (Barzun, 1958). All these arguments ignore the reciprocal process, that humans create their environment as do other organisms, and that an environment created by the legitimation of violence and domination may in the end be less than healthy for its human inhabitants.

It would, of course, be possible to suggest that the arguments presented here have simply been selected because they do support each other. It is for this reason that the examples used have been from readily accessible sources, and have attempted to remain within the mainstream of ethical, religious, or other debate. By doing so, what has been achieved is to point out that seen *in its own terms,* the *DWEP* lacks not only philosophical, but scientific credibility. Many of the examples of support for the new cultural paradigm used here are later extensions of the thoughts of individuals which were used in the formulations of the old cultural paradigm. The Green Paradigm can be regarded as a natural development of human thought. Just as the thought of an individual develops over time under the influence of new experience, so the thoughts and attitudes of society change, particularly in response to changing circumstances.

Numerous other source which could have provided even stronger and more internally coherent support for the Green Paradigm have not been used, specifically because they are outside the mainstream and could thus be dismissed as irrelevantly radical. This does not affect their capacity to support the paradigm. Examples that come to mind would be the environmental ethics of the Pythagoreans, the ethics of Saint Francis and Saint Augustine, or the philosophies of Heraclitus or Spinoza (Naess, 1975: Rolston, 1975; Lloyd, 1980).

It is possible to identify the Green Paradigm. To a limited degree it is even possible to operate according to many of its assumptions. Yet it would be incorrect to suggest that a paradigm shift has taken place. The DWEP remains more or less unchallenged as the `appropriate' way to view interactions with Nature. The growth of the Green Paradigm remains, at present, just another anomaly with which the DWEP has to deal. Until there is a noticeable swing in support for the Green Paradigm, and that presupposes a working framework exists, one cannot claim that a revolution has taken place. Identifying alternatives and actually choosing one are very different things.

Chapter 5

SHADES OF GREEN:

Constructing A Green Society

Introduction

It might seem reasonable to expect those working within the Green Paradigm to have agreed on an approach. An awareness, perhaps, that the issue is one which requires co-operation and discussion, and which particularly requires a united front. Such unity is, however, rather lacking in many areas. There is certainly an awareness in some circles that unity and discussion are important, but in many instances groups have become so wrapped up in their approach to the issue that they disparage, or even refuse to acknowledge, other approaches (Tokar, 1988). This is by no means to suggest that there is only one `correct' interpretation of the Green Paradigm - on the contrary there is certainly progress to be found in healthy disagreement, but one might expect people to be aware that they are at least on the same side.

The purpose of this chapter is to attempt to identify the characteristics of a social system which would might from the adoption of the Green Paradigm, and indeed to see if such a system is possible at all. This is achieved through the examination of a number of schools of thought which have explicitly adopted the central idea of the Green Paradigm, namely that people are an integral part of a complex planetary system. Such an identifying characteristic necessarily eliminates other social justice or activist groups or movements which might have contributions to make, but which are not explicitly Green. This is not to say that these contributions, because they are not explicitly Green, are not of any use - they certainly are, and were explored briefly in the previous chapter - rather it is that the aim of this chapter is to attempt to extrapolate from present Green groups to a Green society, and to use this creation as to support the central hypothesis; that geography will only be able to deal with the `environmental crisis' when it has developed a Green framework. If science is a social product, it would be unreasonable to expect a Green geography to attract any support if it were not possible to at least outline a framework of a Green society; in effect to argue that the Greening of geography is a socially useful act. Since such a framework does not exist at present, this extrapolation from explicitly Green schools of thought is the only way forward. The introduction of ideas which are not explicitly Green would thus defeat the purpose of the argument.

The issue is a complex one, and it is hardly surprising that more than one approach has emerged. The main groups, those which can claim any significant support, are the Social Ecologists, Deep Ecologists, Eco-feminists, and the Gaia hypothesis. There are others, for example Eco-Philosophy (Skolimowski, 1984), but for the sake of clarity of debate it has been necessary to limit the scope of this particular enquiry. Each group, or school, has emerged in a particular set of historical circumstances and concerns which have shaped its present form. Each must therefore be examined in turn in an attempt to compare approaches and identify points of significant agreement and departure. One must remember, however, that just as there is no single `Green' school, so these four hypotheses have their own internal interpretations of what they themselves mean. There is thus no single set of rules for being a Deep Ecologist, for example.

By the same token, this is not an attempt to find the `Greenest' theory. Each of the groups discussed here has a valuable contribution to make to the ultimate development of the Green Paradigm, and some offer suggested solutions for particular problems. In a truly holistic sense each theory is a whole in itself, and at the same time contributes to the larger whole, the Green Paradigm. Each school has a particular focus, one which deals with what are in effect the most significant problem areas in the DWEP. Social Ecology provides what is intended to be a socially aware, Green-based critique of the inequalities of the DWEP, and a proposed social structure for dealing with these. Eco-feminism criticizes the power structures and the often deeply hidden psycho-sexual nature of the human-nature relationship, and offers concrete suggestions for a different way of relating to Nature. Deep Ecology is an attempt to develop a philosophical system which can support an alternative and explicitly Green social structure, and the Gaia hypothesis, while not a fully developed or accepted theory, suggests that science has a significant role in the development and the maintenance of a Green society.

Social Ecology

Social Ecology, particularly the branch in the United States of America, was pioneered by Murray Bookchin and his colleagues at the Institute of Social Ecology. Its supporters have quite definite ideas about what Social Ecology is, seeing it as a rational approach which is centred firmly in reality; a form of naturalism which turns to evolution and the biosphere for explanation of social phenomena. They stress the imbeddedness of the human consciousness in nature, a radical ecological critique of hierarchy and domination in society, and the historical unity of ecological and social concerns (Bookchin, 1982).

The philosophical roots of Social Ecology stem from an organismic *(thisworldly)* tradition in Western philosophy, a tradition which begins with Heraclitus and Aristotle, and which critiques Western thought via Hegel and the Frankfurt school. Social Ecology particularly rejects logical positivism and primitive mysticism (Bookchin, 1988).

Social Ecology emerged in the crises of the sixties, as a response to the perception that modern society was increasingly urbanized, highly industrialized, and capped by a swollen, bureaucratized, and anonymous state structure (Bookchin, 1971). This was a revolutionary reaction, and remains one in its attempt to:

> "critically unmask the entire evolution of hierarchy in all its forms, including neo-Malthusian elitism, eco-brutalism ..., anti-humanism ..., and the latent racism, first-world arrogance, and Yuppie-nihilism of post- modernistic spiritualism" (Bookchin, 1988, p. 26).

Behind the quaintly florid prose hides a serious attempt at integrating inter-human, and human-nature relationships. In claiming historical links with the anarcho-communism of Petr Kropotkin, Social Ecology raises to primacy the point that if humans cannot sort out their relationships with one-another, particularly in the form of ending exploitation, there can be little hope of establishing a healthier relationship with nature.

This is a question which would present itself through the experience of eco-activists; so it should come as no surprise that Social Ecology is very much an activist approach. Social Ecology aligns itself with the socially radical tendencies of the German Greens, with the extra-parliamentary street movement of European cities, with radical American Eco-feminists and citizen's rights movements, with anti-imperialist movements globally, and with struggles for freedom from racial oppression (Bookchin, 1988). It has attracted political activists from numerous backgrounds who have come to recognize the ecological crisis as the overriding human dilemma. The merging of peace activists, feminists, and socialists which led to the founding of the Green movement in Europe was largely prefigured by Social Ecology, whose supporters have been arguing since the mid-1960s that the view of nature as a force to be controlled was the result of social hierarchies, particularly warrior societies (Tokar, 1988). Social Ecologists argue that domination is neither intrinsic in nature, nor has it ever been an appropriate response to the needs of human survival. Instead the patterns of the natural world suggest that the values of cooperation, complementarity, and unity-in-diversity, both in inter-human and human-nature relations would be more appropriate to such an end (Bookchin, 1971, 1980).

Social Ecology claims a humanistic perspective, attempting to reject both biocentricity - because it perceives this as degrading or denying the uniqueness of human beings, human subjectivity, rationality, aesthetic sensibility, and the ethical potential of humanity; as well as anthropocentrism - which it sees as the right of a few to plunder the world of life. It goes so far as to perceive centricity of any type as being synonymous with domination and hierarchy, whether it be of nature by people, or of people by nature.

Nevertheless, Social Ecology acknowledges the potential of humans to alter nature; to create a second, cultural, nature out of the first primeval one. Humans are a part of nature; to separate them is to divide and truncate Nature itself. Society, as a natural product of a natural species, is therefore of significance in nature. It can be regarded as an evolutionary adaptation, and Social Ecology places great stock in evolution. If humans accept that they are a part of the natural system, then those distinctly human traits, like sophisticated communication and the ability to alter nature, can be placed at the service of evolution itself[1]. An analogy might be drawn with the one other creature on the planet whose constructions rival, or even surpass, those of people; the coral polyp. The tiny polyp builds vast cities which cover thousands of square kilometers; the Great Barrier Reef, for example, would dwarf Manhattan, and yet the polyp's constructions provide enhanced life potential for perhaps millions of other species; Manhattan for very few. For Social Ecologist people thus face a choice; whether to use the potential they have been granted, or to cut across the grain and simplify the biosphere, exterminate species, and pollute the planet. The decision they ultimately make is going to be socially determined (Bookchin, 1988). Social activism is thus essential in order to inform people of the choices they face.

Even more than this; to some extent nature is a human invention. This is not to say that people created the world; what it means is rather that the human sense of what nature is arises from human experience of history and geography. The view so dominant today, that nature is an external, is unconsciously confirmed by the spatial organisation of society, in which intellectual life and work are urban. For intellectuals the view is reinforced by their placement into the institutions of intellectual life, the universities and similar, which are dominated by academic disciplines and the power of science as the form of social knowledge (Fitzsimmons, 1989). In other words it

1 Which presupposes Social Ecologists know where evolution is going. There are numerous sweeping statements made by supporters of the four schools examined in this chapter. They are presented largely without comment for the sake of brevity.

requires a deliberate and conscious application of mind to overcome the artificial distinction between human and nature, because even our perception of what nature is, is an artificial abstraction and construction.

For Social Ecology the notion that people must dominate nature emerges directly from the domination of some people by others. The competitive element of Western society not only pits people against each other, but against the natural world. People are reduced to the value of their labour power and become commodities. Nature is reduced to its value to industry or some similar process, and it too becomes a commodity, a resource to be used, exploited, overexploited, and exhausted.

The uniqueness of Nature has no place in these terms. For Social Ecologists people are oversimplifying the `environment'. In this context the encroachment of cities of steel, glass, and concrete on a rich organic landscape has cultural as well as physical dimensions. The mechanisms needed to control the vast urban populations - to feed, transport, employ, and entertain the millions - lead to a decline in civic and social standards. Bureaucracies replace humanistic approaches. Spontaneity, creativity, and individualization become dangerous to the status quo, and are replaced by the standardized, the regulated, and the massified. The individual is given less and less social space, and is increasingly faced by the `lowest common denominator' approach to social well-being (Bookchin, 1971).

The phrase `consumer society' is so common its implications are seldom recognized any more. Needs are tailored by the mass media to create a demand for useless commodities, each with the factor of `planned obsolescence' built in. After a certain period of time they will be useless, broken, or simply out of date. Whatever the reason, they will have to be replaced. The plundering of the human spirit by the market is a macabre echo of the plundering of the Earth by human greed (Bookchin, 1971).

> "The point is that man (sic) is undoing the work of organic evolution. By creating vast urban agglomerations of concrete, metal and glass, by overriding and undermining the complex, subtly organized ecosystems that constitute local differences in the natural world - in short, by replacing a highly complex, organic environment with a simplified, in-organic one - man is disassembling the biotic pyramid that supported humanity for countless millennia. In the course of replacing the complex ecological relationships, on which all advanced living things depend, for more elementary relationships, man is steadily restoring the biosphere to a stage which will be able to support only simpler forms of life. If this great reversal of the evolutionary process continues, it is by no means fanciful to suppose that the pre-conditions for higher forms of life will be irreparably destroyed and

> the Earth will become incapable of supporting man himself" (Bookchin, 1971)[2].

Social Ecology emphasizes the anarcho-communist ideals of balanced community, face-to-face democracy, humanistic technology, and decentralized society; not simply as desirable, but as absolute necessities for the continued survival of the species. In essence it proposes ethical constraints on human activity.

The ecological concept of maintaining biotic diversity, particularly as it applies to agriculture, emphasizes that the stability of an ecosystem depends heavily on the number of species in the system, and the degree of variety; the greater these factors, the more stable the ecosystem will tend to be. If the `environment' is simplified, it is argued that fluctuations in species populations become marked and can rapidly reach pest proportions. One thinks of the vast tracts of land devoted to single crop agribusiness, with its total dependence on poisons like insecticides and herbicides to retain control, as well as the enormous energy consumption (particularly petrochemical fuels) involved in such a system. The only way to reduce this unhealthy dependence on harmful, and imported, substances is to alter the farming pattern to one which is more internally stable (Bookchin, 1971).

The replacement for such a system will almost definitely have to be smaller scale, effectively decentralized. A move away from the gigantic scales of agribusiness to what could be called `human-scale' farming. The farmer would thus regain contact with the land, practicing truly ecological cultivation, aware of the subtleties and potentials of each segment of the farm, and keeping the production cycle as closed and as self-sufficient as possible.

The same reasoning has been applied to urban energy consumption. It has already been noted that one of the dominant features of technological progress is the increased per capita energy consumption. Urban conglomerations simply require more energy to operate, and where pre-industrial systems could use different energy sources - wood, coal, peat, or whatever; urban centres are almost totally dependant on corporate-supplied electricity and fossil fuels. Utilization of other sources, solar generation, wind turbines, etc., is almost impossible on a large scale in a city, unless huge areas are to be devoted to sun and wind farms. On individual, household scales, they become more practical.

A significant problem with Social Ecology, particularly in the United States of America, is its centralization around Murray Bookchin, a major part of this problem is his confrontational attitude and style of writing. As Tokar (1988) points out:

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2 This paper apparently precedes the raising of Prof. Bookchin's consciousness sufficiently far for him to avoid using sexist language.

> "Murray Bookchin's continuing contributions are indispensable for anyone seeking a philosophical and political grounding for ecological activism - his writings appear in both major anthologies of Deep Ecological thought - but one person's brilliant insights cannot replace the essential process of an evolving movement for social change having to define itself" (p. 139).

Social Ecology is slowly gaining a tenuous foothold as an area of academic investigation (e.g. Fitzsimmons, 1989; Lavrov, 1989), at least in part because many of the conceptual tools for its implementation have been developed over the years in Marxian theory. Not that there is not still a great deal of work to be done, nor that this indicates either that Social Ecology is accepted as valid within `socialist' countries, and particularly not that Social Ecologists consider these `socialist' countries to be good examples. Bookchin frequently attacks the anti-individual bureaucratic nature of the Eastern Bloc, and Fitzsimmons (1989) comments how the adoption by the Communist Parties of Lenin's idea that the revolutionary proletariat was necessarily the manufacturing working class, has held up theoretical work in the field. Others too accept that `ecologism' is a distinct and separate approach to either traditional right, or traditional left, ideologies (Tokar, 1988; Bramwell, 1989;).

Within both Eastern and Western Geography, as examples of a science, it is becoming acceptable to talk about an ecological paradigm (Douglas, 1987; Zhekulin *et al*, 1987). Social Ecology as a scientific approach is necessarily different to its activist permutation. It can in this instance be described as the set of sciences studying the interrelations of society and its environment, including the principles of organisation of human activities, and taking into account the objective requirements of ecological laws (Lavrov, 1989).

The Soviet perspective of Social Ecology appears to be better defined than the Western, possibly because of the more ready acceptance of some of the inherent principles. Nevertheless, some telling blows are levelled at the old paradigm. Approaching from the theoretical perspective of Marx and Engels that one's attitude to Nature is conditioned by the form of society, Social Ecologists are beginning to dismiss the simplistic opposition between capitalism and socialism in the face of overwhelming evidence.

> "Euphoria regarding the supposed automatic elimination of ecological problems under planned economies has long since faded, and the global nature of ecological problems has been revealed, with centres of ecological tension appearing in many regions of the world. The driving forces behind faulty ecological decision making, as well as the ecological consequences of these decisions, have been varied; in one instance it has been the actions of the multinational corporations, and in another, bureaucratic decisions in the area of the extensive development of the

> economy. Various social roots in both cases have led to similar ecological, and thus also social consequences. The social and ecological here are not only interrelated, but so tightly interrelated that it is practically impossible to separate them" (Lavrov, 1989, p. 671).

There is recognition, and general agreement, that "Ecological stress finds its origin in the sphere of technology" (Koptyug, 1988, p. 26). Such stress is multiplied significantly by incompetent bureaucratic decisions (e.g. concentrating polluting industries together) as well as in agriculture (e.g. major animal husbandry complexes). Socioeconomic objectives and decisions of a previous era gave birth to present ecological problems, and the present ecological situation in its turn gives rise to social tension. The social-ecological tie is unbreakable (Lavrov, 1989).

For Soviet scientists, Social Ecology has a distinct structure. It consists of a nucleus (theoretical Social Ecology) which links in an interdisciplinary fashion with other disciplines; for example it would overlap with economics in the field of `environmental' economics; with geography in geoecology; in biology with ecology. It also links with philosophy, law, medical demography, and geology (Lavrov, 1989).

The Soviet Social Ecologists similarly recognize the limits of contemporary ecological theory in that it is unable to examine global and social perspectives. This they see as the main task of Social Ecology. Determining human requirements and their reasonable limits is, they feel, a task for economics and philosophy. Such a perspective is obviously at odds with the activist American school's approach. It is also not a truly Green approach, since it does not incorporate the essential core of the Green Paradigm. Soviet Social Ecology is nevertheless useful for its structural analysis of the interplay between society and nature.

Social Ecology is developing quickly. It is becoming a human science, with an emphasis on integrational and interdisciplinary research, research informed by the philosophies and economics of the activists in the field. It has moved well beyond its activist American roots, though these still remain integral and will continue to inform its development. This will also be a point of friction in the future, since a Marx/Engels based approach, as exemplified by the Soviets, need not incorporate the insights of Kropotkin and Reclus which the American school feels to be paramount. It could quite easily happen that a Soviet-style approach would drift back into the style of the Dominant Western Environmental Paradigm; reductionist, hierarchical, and anthropocentric. Should this occur, there would be two distinct camps both with the same name.

Deep Ecology[3]

In a path-breaking 1973 paper Arne Naess raised ecological issues as a point of concern not only for ecologists and `conservationists', but for philosophers and ordinary citizens. In it he coined the term `Deep Ecology', which he distinguished from what he saw as `shallow', or reform, ecology. Shallow ecology was content merely to patch things up, to go along with the flow, as it were, and attempt to minimize the damage, or to mend things where possible. Deep Ecology aimed to be a more probing, questioning, challenging kind of ecology. It is more a product of traditional and transcendental `environmental' concerns, celebrating individual, personal relationships with the ever-shrinking `wild' nature, and embracing a wide variety of political, artistic, and philosophical approaches for expressing and deepening the relationship (Tokar, 1988). It draws a line between the biocentric vision of Deep Ecology - in which humans are strictly an equal participant in the biosphere - and the anthropocentric approach of most professional ecologists and `environmentalists'; which sees humans as superior and deems all other species and resources to be there just for its use (Sale, 1988).

As is only to be expected, Deep Ecology has undergone much revision since its initial conception, and the process continues. Deep Ecology was embraced by Bill Devall, a sociologist, and George Sessions, a philosopher, and much of its popularity, particularly in the United States of America, is a result of their early work. The U.S. based activist organisation Earth First! claims Deep Ecology as its philosophical premise. In 1980 Deep Ecology was described as having a number of identifiable roots, all stemming from a "profound" critique of the dominant social paradigm and the overbearingly dominant position of science in the West (Devall, 1980).

Although it has since moved away from it somewhat, Deep Ecology had a strong initial concern with normative ethics; why people do what they do, and how to change this. It was felt that if enough of the major themes of Deep Ecology were sufficiently broadly discussed, clarification of issues would emerge, and a praxis - a plan of action - would present itself. Deep Ecology thus presented a number of its concerns for debate (Devall, 1980).

> 1) A new metaphysics which stresses the identity of humans with non-human nature was seen as a necessary condition for a viable approach to building an eco-philosophy. The human should be seen as an integral part of nature, in a system of `biospherical egalitarianism'. It is not a human duty to perfect nature, nor to attempt to make nature more efficient.

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3 I would like to thank Professors Arne Naess and Bill Devall, as well as Dr Warwick Fox, for their interest and assistance with this section.

2) Citing the works of Spinoza, Deep Ecology argued for an objective approach to Nature; in contrast with what it perceived as the subjective anthropocentrism of prevailing humanistic philosophy, art, and culture.

3) The perception of the human as a part of; in fact integral with, Nature would call for a new standard in psychology.

4) While there is an objective basis for `environmentalism', the objective basis of science under the new paradigm would be different to the narrow analytical conception of the scientific method under the old paradigm. Science would move towards being both objective and participatory, without the Cartesian dualism. The main value of science should be its enhancement of the understanding of self and creation.

5) There should be an acceptance of the inherent stability of natural processes. Massive disruptions of human origin are unethical and harmful. Designs for human settlement should thus be with, rather than against, Nature.

6) The use of the volume of production (e.g. GNP) as a measure of human welfare has little validity in reality. Technology should be seen as an appropriate tool for enhancing welfare; not as an end in itself.

7) The present human population is so large as to be intrusive on the planet, and is detrimental to carrying capacity of the planet. A voluntary decline in population is preferable to massive starvation and the ultimate destruction of the productive capacity of the land through over-cultivation.

8) Too much concentration on the symptoms of the human/nature conflict, such as pollution, may divert attention from more important issues and could thus be counter-productive in the attempt to solve these problems. Economics, for example, should be subordinate to ecology, rather than the reverse situation which exists today.

9) There is nothing which says all societies have to end up as industrial or post-industrial. So-called `primitive' societies frequently have much more sustainable lifestyles than `advanced' ones. There is a great deal to be learned from them.

10) Diversity is in itself a desirable characteristic, both in human cultures and as a principle of health and stability in ecosystems.

11) There is a need for a rapid move towards `soft' energy paths (e.g. renewable sources like solar and wind), appropriate technology, and lifestyles which will result in a decrease in energy use in the First World, and which will enhance the standards of life for the Third World.

12) The goal of education should be the encouragement of spiritual development and the development of the individual in the community, not a simple training for jobs which are only appropriate to bureaucracies and advanced industrial society.

13) There should be more importance placed on leisure as contemplation in art, sport, and play, because it is here that the individual has the greatest opportunity for individual and cultural fulfillment.

14) More emphasis should be place on local autonomy and decentralization of power, since such a democratic system is preferable to centralized, bureaucratic control.

15) In the interim, before such a sustainable society has been achieved, it may be necessary to declare areas of the planet `off-limits' to development of any sort (Devall, 1980).

Deep Ecology's lack of a praxis is an interesting feature. In many ways it appears to be deliberate - almost a resistance to political activity on the part of some of its leading luminaries.

> "There is no political party of Deep Ecologists, no cadre of political revolutionaries. This is not an appropriate approach for Deep Ecologists" (Devall, 1980, p. 317).

Devall is frequently at pains to avoid being labeled revolutionary, and himself uses the term `leftists' to "address anarchists, leftists, and Marxists" (Devall, 1987) in a less-than sympathetic tone, although he acknowledges this to be an oversimplification. Why he should go to this effort to avoid being called revolutionary is not entirely clear, although it is more than likely to be at least in part a response to the rather vicious and personal attacks of Murray Bookchin (an individual who far prefers to tackle the player than the ball)[4] and others. Devall relates that in encounters with these `leftists' he is generally confronted rather than questioned (1987).

There is certainly a validity in Devall's perception that Deep Ecology is not a political movement. Such a vehement denial is, however, potentially harmful to fruitful discussion and progress, should some people wish to interpret Deep Ecology as political. In addition the denial hinges on the definition of `political', rather than the definition of `Deep Ecology'. Still,

> " It would be a mistake, I believe, to refer to this pattern of search for community as politically revolutionary ... But there can be no questions of the inherent radicalism of this type of community. Even so, revolution is not its essential character; for whereas the overriding objective of revolutionary action is the overthrow and capture of an existing social order, with immediate forced adaptation of human behavior to revolutionary power and design, the objectives of the action and thought are, with rare exceptions, peaceful, not concerned with capture and forced adaptation, noncoercive and seeking fulfillment through example or vision rather than through revolutionary force and centralization of power. The uncoverings of those autonomous and free interdependences among human beings which are believed to be natural to man and his morality: this - not the violent capture of government, army, and police - is the most fundamental aim of the tradition of community in Western social thought I call ecological" (Nisbet, 1973, quoted in Devall, 1980, p. 319).

Here, in the traditionally liberal perception of revolution, lies much of Deep Ecology's resistance to being labeled radical - it is not that it is not, if one takes a minimum definition of a radical approach as being to inform change - it is that it is

4 The violence of Bookchin's tirades against people who disagree with him suggests that for an avowed anarcho-communist, he has remarkably little comprehension of the importance of contrary views in the dialectical process.

more afraid of the other connotations of radical or revolutionary which the use of such terms may bring to the mind of potential converts.

Deep Ecology has other strengths. Where Social Ecology has a well developed practical and analytical approach, Deep Ecology is philosophically more internally coherent - due, no doubt at least in part, to the fact that several of its leading exponents are professional philosophers. Deep Ecologists now find themselves inspired by ecology to seek a reconstruction of metaphysics and ontology. They do not, however, limit themselves to scientific modes of discourse, aiming instead at *ecosophy*, or Earth wisdom, and a resultant reconstruction of the dominant cosmology (Por, 1974; Naess, 1987). Deep Ecologists feel it is possible to hold different `ultimate beliefs' in religion and philosophy, and yet still work towards a Deep Ecology position (Devall, 1985, 1987). Indeed for Naess, Deep Ecology is more of a sheltering umbrella for numerous individual interpretations than it is a firm doctrine (Tokar, 1988).

For Devall, Deep Ecology is the process of returning to the roots - the real meaning, for him, of `radical ecology'. Returning to the roots is the process of identifying oneself through, rather than abstract from, one's environment. One's identity is thus with the bioregion, or with the Earth rather than simply with one's Ego. It becomes a process of Self-realisation, rather than self-realisation, to use Naess's distinction. With a broad and deep identification, the Self is strong but permeable, like the surface of a pond. With such an identification it is possible to experience empathy with other aspects of this broad Self - people begin to defend their bioregion as part of their Selves (Devall, 1987), a concept with links not only to geography's sense of place, but also to ideas in ecology explored in the next chapter.

Deep Ecology is frequently accused by its critics of being overly mystical. Arne Naess says that for him, Deep Ecology is not mystical (1984); Devall says that for him it is, although it is not necessarily so (1987). For many Deep Ecologists, intuition is perhaps the most satisfactory way of experiencing Nature. It is physically impossible to comprehend the complexities of Nature - consider, for example, how difficult it would be to fully understand what goes on in a gram of soil when one thousandth of a milligram of a certain poison is administered. It is possible to understand quite a lot about the planet; but to actually *know* everything, as science defines knowledge, seems rather unlikely. If one cannot *know* all the countless millions of living things and their interactions in one teaspoonful of mud, how much can people say they really know? (Naess, 1984).

Deep Ecology's response to this dilemma is a search for meaning in a nihilistic age. Where science is forced to become more and more reductionist in the search for something it can really know[5], some Deep Ecologists question why the pronouncements of experts are made to seem more real than the actual experience of the individual. They raise the question of the validity of the narrow, abstract, scientific perception of Nature in the face of the rich, meaningful *experience* of it (Devall, 1987).

Even though its main strength is theory, Deep Ecology acknowledges the value of, and necessity for, people who do what it calls the many kinds of `real work'. Those who defend forests by standing in front of bulldozers are seen as defending it as a part of their own being. Interestingly, despite much of the rhetoric rejecting the Social Ecology criticisms, Deep Ecology also emphasizes the importance of the anarchistic approach. Anarchy again is not seen as instability or egoism; it is a self-regulating system. Lacking a central authority or hierarchy, any social movement which relies on an anarchistic form of organisation necessitates each person's working from an ethical base, and that they consider all the consequences of their actions. It is perceived as a positive step toward building ecologically aware communities. While Deep Ecologists are engaged in the criticism of the Dominant Western Environmental Paradigm, continual questioning, and the pointing out of the failures of techno-industrial civilization, they are simultaneously engaged in the positive tasks of constructing different visions of reality and of presenting ecotopian visions of harmony between people and the rest of nature (Devall, 1987).

By 1988 Deep Ecologists had extended the three basic principles. Those were; firstly, that all life, human and non-human, has a value in itself and that humans have no right to reduce the diversity except to satisfy vital needs. Secondly, that at present humans are too numerous and intrusive with respect to other life forms, and that a substantial decrease in the human population is required to permit the Earth to flourish. Thirdly, if such a balance is to be achieved, significant changes would need to be made in human cultures, with stress on sustainability rather than consumption, and an emphasis on the non-material side of life (Sale, 1988).

From these original ideas, other key concepts developed:

Primacy of the wilderness. Wilderness is increasingly seen as having a value in its own, not simply as a place where humans may begin to understand their place in the organic wholeness, but where the myriad of species may thrive by themselves, for themselves.

A sense of place: The perception that human well-being requires some sense of rootedness, a knowledge that a particular piece of land is home. It also implies that one identifies with one's place.

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5 A reductionism which is completely undermined by quantum and chaos theories.

An opposition to industrial society: For Deep Ecologists, industrialization in predicated upon a separation from, and an exploitation of, Nature. Both of these are rejected by Deep Ecologists.

An opposition to the concept of stewardship: Stewardship is often offered as a supposedly benign way for people to rule nature. It does, however, retain the perception of the world as being a collection of resources for human use. Its roots lie in the sense of *sty-warden*; master of the pigsty - and imply human decision-making, human control, and human use.

Identification with primal peoples: The traditional euro-centric Western perception of primal groups is that they are primitive and unsophisticated. Deep Ecology recognizes that many of these groups have lifestyles which are in balance with their environment; which are indefinitely sustainable - in contrast with the lifestyles framed within the DWEP. For Deep Ecologists, there is much to be learned from these peoples.

Spirituality: There is certainly a place for a rational approach, but for Deep Ecologists this does not mean that it supersedes an understanding of Nature which may come about from intuition, emotion, experience, and a spiritual connection with the non-human world.

Self-realisation: For Deep Ecologists, self-realisation is more than identification of their ego. Self-realisation implies an identification with the larger, biotic `self'. The greater the individual's identification with the more complex `greater self', the greater the Self-realisation of that individual (Sale, 1988).

Deep Ecology appears to be undergoing a maturation process. While attempting to retain much of the idealism which marked its early years, exposure to increasing scientific and public scrutiny is having the effect of forcing it to take positions on real, rather that purely hypothetical, issues. This is particularly true in the United States of America, where the activist enterprises of Earth First! have caused significant comment from the public (Manes, 1990), and are a source of ongoing criticism from Social Ecologists (Tokar, 1988). It is developing a praxis of its own, becoming more practical, more concerned with tangible issues, while attempting to retain its philosophical strength.

In its most recent manifestation, Deep Ecology has been linked to transpersonal psychology, extending both the definitions of Deep Ecology - by clarifying it in psychological terms as an attitude - and transpersonal psychology - extending this to include the non-human (Fox, 1990). On a closer analysis of Naess's conception of Deep Ecology, it is possible to identify three closely related, although analytically distinct, senses of the term. These have been referred to as the *popular, formal,* and *philosophical* (Fox, 1989).

In its *popular* sense; the sense in which most people understand Deep Ecology, it is taken to refer to a non-anthropocentric, or an ecocentric, approach to life in the world. An anthropocentric approach is content to see the world as being nothing more than a collection of `resources' there for whatever exploitation humans can think of. On the other hand an ecocentric approach, although it recognizes the obvious practical limitations, will allow all entities the freedom to unfold in their own ways, unhindered by all the various forms of human domination.

It is not only destruction of nature which can be seen as anthropocentric.

> "We exhibit an anthropocentric orientation not only when we see the nonhuman world as there simply to be dammed, pulped, mined, slaughtered, and so on, but also whenever we argue that the nonhuman world should be *conserved* or *preserved* because of its use value to humans (e.g., its scientific, recreational, or aesthetic value) rather than for its own sake or for its value to *nonhuman* beings" (Fox, 1989, p. 33).

In the context of anthropocentrism and Deep Ecology, it is important to note that the ecocentric sense of Deep Ecology is not in itself sufficient to distinguish Deep Ecologist ecophilosophers from other ecophilosophers, since the majority of ecophilosophers are concerned with the development of a point of view which is to a reasonable degree nonanthropocentric. In other words, there is nothing in the popular (ecocentric) sense of Deep Ecology which is truly distinctive (Fox, 1989).

The *formal* sense of Deep Ecology is revealing of its structure and some of its assumptions. For Naess, Deep Ecology is predicated on the idea of asking successively deeper questions (Why A? Because B. Why B? Because C; etc) about the ecological relationships of which people are a part. It is assumed that this progression will ultimately reveal the bedrock assumptions Naess calls `fundamentals'. These fundamentals would take the form of notions such as `one shall obey God' or, `one shall further the ends of evolution'. For Naess a true Deep Ecological point of view is based upon fundamentals, while a shallow point of view is not (Naess, 1987). This sense is formal in that it makes no assumptions about the content of the answers to the progressively deeper questions. Naess is clear on the point that it is this progressively deeper questioning which is the reason for the adjective `deep' in the term `Deep Ecology'. It is, for him, an abbreviation for a deep questioning approach to ecology (Fox, 1989).

There is less than complete agreement on the validity of Naess' assumptions. It is, in fact, just as easy to derive anthropocentric views from fundamentals; and many anthropocentric views are so derived. In other words, Naess' formal sense of asking deeper questions is not a tenable sense of Deep Ecology, since it fails to distinguish adequately between anthropocentric and ecocentric views (Fox, 1990).

The *philosophical* sense of Deep Ecology as understood by Naess refers to the concept of Self-realisation (with a capital S) inspired by the works of Gandhi and Spinoza (Naess, 1986, 1987). In this sense it is understood to refer to as expansive a sense of Self as possible. It is thus different to self-realisation (lower case), because where Self-realisation refers to a wide, expansive, inclusive sense of Self; self-realisation implies a narrow, atomistic, exclusive sense of self. Where the former leads to compassion, the latter leads to egoism (Fox, 1989).

For Fox, the *philosophical* sense of Deep Ecology in its use of Self-realisation is in fact the *fundamental* from which Naess derives his own perception of Deep Ecology. Naess claims that any view which proceeds from fundamentals is by definition a philosophical one, since the act of asking progressively deeper questions quickly takes the questioner into the realms of philosophy. The philosophical sense is both tenable and distinctive; being neither demonstrably false, nor logically inconsistent. It is distinctive in that where the majority of ecophilosophers are attempting to establish the fact that nonhuman entities have intrinsic value - value in and for themselves - Deep Ecologists are on the other hand concerned with the advocation of a realisation of a certain state of being. For Deep Ecologists what is important is the *thisworldly* creation of as expansive a sense of Self-realisation as possible. The difference is crucial; the result of the conventional attempt to give intrinsic value to the nonhuman would be a new set of moral norms and codes of conduct - more rules about permissible behaviour. The result of an expanded concept of Self is that protection of free Nature is felt as the protection of our selves. There is no moral persuasion required to make people live, and there would be no moral persuasion required to make them care for Nature - they would be the same thing.

Eco-feminism[6]

Where Deep Ecology emerged as a critique of the Dominant Western Environmental Paradigm, Eco-feminism has emerged and placed much of its focus on a critique of Deep Ecology. In this respect it is a critique of a critique. One of the earliest Eco-feminist writings - which claimed to be specifically Eco-feminist rather than simply feminist - was framed in the form of a systematic attack on Deep Ecology, and even the title claimed Eco-feminism was "deeper than Deep Ecology" (Salleh, 1984). The paper begins with Naess' rejection of the Man/Nature dualism and its replacement

6 I would like to thank Prof. Michael Zimmerman and Dr Warwick Fox for their assistance with this section.

with the *relational total field image* of Deep Ecology; where man is not simply in the `environment', but of it. The Eco-feminist criticism contends that Deep Ecologists have failed to recognize the source of this dualism, and that a generic use of *Man* is not applicable. The contention is that women are closer to Nature than men. Their monthly fertility cycle and the trauma of pregnancy are seen to grant women a consciousness of being co-terminous with Nature which is not accessible to men. By using the generic *Man*, Deep Ecologists overlook the differences in the sexes. They miss the point that if the lived experience of women were sufficiently acknowledged in the Western culture; it could provide a model for the alternative consciousness which Deep Ecology is attempting to formulate (Salleh, 1984).

The second premise of Deep Ecology with which Eco-feminists argue is *biospherical egalitarianism.* Salleh contends that such an objective will be impossible to meet until men recognize that the master-slave role of human-nature interactions is replicated in man-woman interactions. Not only that, but Salleh sees Naess as suggesting that this inter-species equality can only be achieved by artificially controlling the growth of the human population. For her this is a rationalist and technicist (and thus masculine) approach to a problem, as well as being a grasp at women's special potency as creators of life (Salleh, 1984).

Deep Ecology's *principle of diversity and symbiosis*, which is seen as supporting cultural multiplicities and appreciating the traditions of regions previously disregarded as `primitive' is granted a modicum of support, but Eco-feminists suggest the analysis is not taken far enough. For Eco-feminists this rejection of anthropocentrism and ethnocentrism would be incomplete if it did not take in to account the female half of the human race and the factors which have impeded the progress of women through-out history. A progressive attitude toward Nature *per se* does not do much to change entrenched sexist attitudes.

Where Deep Ecology rejects exploitation through its *anti-class* stance, Eco-feminism, while not arguing the premise, queries the absence of comment on sexual oppression and the social differentiation thus produced. Again Eco-feminism rejects the subsuming of women into a generic human category, contending that by bypassing the parallel between the original exploitation of nature as object-and-commodity resource and women as object-and-commodity resource, Deep Ecology can remain only superficially descriptive and loses its edge in structural critique. Eco-feminism does not, however, question Deep Ecology's non-violent stance, and supports its perception of change as a gradual and piecemeal process.

In the continual quest for an `environmentally' sound society, one of the most potentially damaging elements to the cause is the `after-hours environmentalist'; a syndrome characterized by superficial concern. Careful examination is required to ensure that measures intended to alleviate problems do not in themselves cause further problems, and there is a lot more to being Green than simply buying the correct label. In this regard Eco-feminists suggest that women may be better at putting concern into practice than may men. This would be because women are to a greater degree still excluded from full participation in the social-occupational structure, and as such are less subject to the pressures of work and status rewards which may be exerted to silence the activist professional. In spite of the fact that women are targeted as the main purchasers/consumers of many of the goods of western society, they retain a level of control in the domestic labour force which can exert pressure to recycle, protest, or boycott, with a unity generally unmatched by men (King, 1983b).

On a more radical level; women, who fare worse than men under the status quo, may be seen as more receptive to notions that the status quo is at fault - that it contains a measure of ideological pollution. As such it is reasonable to assume that since they have more to gain from a change in societal structure, they will be more active in pushing for such a change.

Another of Deep Ecology's earlier premises was that of *complexity, not complication*. The suggestion in this case was that the complex interrelations which exist in Nature should be preserved as far as possible, and that human interactions should retain both the complexity and a sense of clarity. For Salleh this seems to necessitate a systems theoretical orientation on the part of Deep Ecologists. If the ideal is a complex economy where workers are given the opportunity to escape alienation by being involved in all sorts of tasks in the production process, thus being able to identify with the finished product, then Eco-feminists see problems not only in the implementation of the proposal, but in its supporting arguments. Much of the justification used by Deep Ecology for its perception relies on highly instrumental terminology such as `soft future research', `policy implementation', and `exponential growth of technical skills and intervention'. For Eco-feminists what this signifies is that the masculine sense of self worth under the Dominant Western Environmental Paradigm has become so entrenched in scientific habits of thought that it is almost impossible for men to construct a satisfactory argument without resorting to excessively technological and scientific language to prove the point. Since women are currently socialized for a number of different tasks - domestic labour, nurturing, etc - they are much freer of the inhibitions of status validations. In fact the typical female role runs counter to this exploitative technicist rationality dominant in male circles. Although the female role is generally treated with disdain, it could provide a satisfactory model for an alternative set of values in society, in a genuinely grounded and nurturant `environmentalism' (Salleh, 1984).

In his assumption about the importance of *local autonomy and decentralization*, Naess (1987) points out that the more dependent a region is on resources from outside its locality, the more vulnerable it is, both socially and ecologically. If self-sufficiency is to work, it requires political decentralization. For Eco-feminists, one of the more invariant features of the dominant patriarchal society is the move toward ever larger and more hierarchical political structures; something they see as an inherently masculine impulse. Women, it is claimed, prefer to organize themselves in small collectives, structured only by the flow of information. Until Deep Ecologists can recognize that there is a gender basis to the hierarchical constructs, they will be unable to do anything real about instituting notions of autonomy and decentralization (Salleh, 1984).

Close reading of this critique reveals an interesting set of assumptions within Eco-feminism. Whereas in the past some feminists were content to call for equal rights with men, experience has taught that this alone is insufficient, although this sensitivity is obviously not restricted to Eco-feminists, and may be found in other feminist writing (e.g. Griffin, 1978, Momsen & Townsend, 1987). Western society has developed under masculine guidance, and with masculine ideals, values, and goals. For many feminists there is agreement that a major source of contemporary social and `environmental' ills lies in the fact that patriarchal culture has on one hand repressed and devalued female experience, and on the other hand absolutized and universalized male experience (Griffin, 1978; Gray, 1979; Merchant, 1980; Starhawk, 1982; McMillan, 1982, Caldecott, 1983; Zimmerman, 1987). In other words the Dominant Western Environmental Paradigm has taken the male experience of life to be the standard against which to measure. For feminists to simply demand equality of opportunity is for them to accept that the masculine perspective is more valuable than their own.

What Eco-feminists have instead concluded is that the unwarranted universalization of masculine categories over the millennia has lead to the lopsided practices which are presently responsible for the domination of nature and women (Reuther, 1975; Adler, 1979; Merchant, 1980; Spretnak, 1982, Caldecott, 1983). Feminists are attempting to point out that there are aspects to humanity which have been obscured by the act of taking the masculine to represent the human. Illuminating and challenging these perceptions could revolutionize and overturn much of existing thought. As long as men raised under a patriarchal system denigrate women, and as long as they continue to conceive of nature as female, it can be expected that they will continue in their attempts to deny what they consider to be the feminine/natural within themselves, and to continue to control what they see as the feminine/natural outside themselves (Zimmerman, 1987).

This perception of male superiority to females (and thus nature) is explained by feminists as having arisen many thousands of years ago. Men gradually began to define the male as being truly human, possibly on the grounds of their superior strength and independence (Gilligan, 1982). The female, being more closely linked to nature through fertility cycles, birth, lactation, etc, was regarded as only partly human. When men discovered their role in pregnancy it enabled them to dispense with the notion that women possessed some mysterious life-force within themselves. Instead they came to be seen as mere carriers of the seed implanted by men. For men the ability to create a life with so little personal involvement could have led to their seeing God as a transcendent, non-natural male source of power. The God replaced the goddess, who had emphasized pleasure, affiliation, harmony, and mutual caring. The God emphasized power, independence, hierarchy, and the separation between nature and males. It was the beginning of the human worship of power (Gilligan, 1982).

> "Patriarchy is an ideology founded on the assumption that man is distinct from the animal and superior to it. The basis for this superiority is man's contact with a higher power/knowledge called god, reason, or control. The reason for man's existence is to shed all animal residue and realise fully his 'divine' nature, the part that *seems* unlike any part owned by animals - mind, spirit, or control. In the process of achieving this, man has attempted to subdue nature both outside and inside himself; he has created a substitute environment in which he appears to be no longer dependent on nature. The aim of the most influential human minds has been to create a fictitious world, a world dominated by man, the one creature in control of his own destiny. This world, if complete, would be *entirely* in man's control...and man himself would have eradicated or concealed his basic bodily and emotional bonds to nature" (French, 1985, p. 341).

It is maintained by many that the patriarchal view of nature as something fearsome and wild was for centuries tempered by the alternative view of Mother Nature; kind, generous, and life-giving (e.g. Glacken, 1966, 1967, 1970; Merchant, 1980). This perception was later replaced by the perception of nature as a fearsome woman who must be known to be controlled (Merchant, 1980).

> "The metaphor of the Earth as a nurturing mother was gradually to vanish as the Scientific Revolution proceeded to mechanize and rationalize the world view. The second image, nature as disorder, called forth an important modern idea, that of power over nature. Two new ideas, those of mechanism and mastery of nature, became core concepts of the modern world...the female Earth and the virgin Earth were subdued by the machine" (Merchant, 1980, p. 2).

THE GREEN PARADIGM

The Dominant Western Environmental Paradigm takes for granted that humans are the source of truth, value, and meaning, and that nature is given value only in its interaction with people. It is seen as necessary for human survival and security that nature be channelled and repressed. Within the context of industrial society men are trained and disciplined in ways calculated to repress the useless and counterproductive aspects of nature that they have within them; including those `womanly' sensibilities, feelings, and emotions. Power over the human organism is one of the most crucial ingredients in the technological domination of the rest of nature. This technological project is rooted in the scientific revolution. The ultimate rationalism of Descartes' can be perceived as the product of a masculine perception of self and reality. Men are cut off from their feelings and become isolated, rigid, excessively rational, and committed to abstract principles at the expense of real personal relationships. A result of this attachment to the abstract is the development of highly rationalistic moral philosophies, which include little or no reference to notions such as *feeling,* or *caring* as bases for ethical systems (Zimmerman, 1987).

> "What seems to be lacking in much of the literature in environmental ethics (and ethics in general) is the open admission that we cannot even begin to talk about the issue of ethics unless we admit that we *care (or feel something)*...it is here that the emphasis of many feminists on personal experience and emotion has much to offer in the way of reformulating our traditional notion of ethics" (Kheel, 1985, p. 143-144).

For most feminists modern moral theory is fundamentally imbedded in a patriarchal/androcentric mode of thought. It is this thought system which has been responsible for the domination of nature, and this system which lacks the intuitive sensibility which feminists maintain is required for the new ethos, an ethos which attempts to overcome the nature-human dualism (Zimmerman, 1987).

> "...we live in a culture that is founded on the repudiation and domination of nature. This has special significance for women because in patriarchal thought, women are believed to be closer to nature than men. This gives women a particular stake in ending the domination of nature - in healing the alienation between human and nonhuman nature" (King, 1983a, p. 16).

The claim of Eco-feminists and feminists with leanings towards `environmental' issues is thus that through linking and identifying women with Nature, the attitude towards nature (the need to control and dominate it) assimilates the irrationality and ambivalence of the attitude toward women (of a need to control and dominate). The assumption of a link between the need to dominate women and a need to dominate nature is one of the identifying features of Eco-feminist writing. (Cheney, 1987). Eco-feminists see

> "Life on Earth as an interconnected web...hierarchy is projected onto nature and then used to justify social domination. Therefore, Eco-feminist theory seeks to show the connections between all forms of domination, including the domination of non-human nature, and Eco-feminism is necessarily anti-hierarchical" (King, 1983a, p. 17).

For Eco-feminists it is no longer sufficient to claim equal status with men, since the context within which such status would be claimed is essentially masculine, and the status itself would be defined in terms of masculine categories. At the more radical fringes of feminist thought the distinctions between sex and gender begin to get a little blurred. It is accepted that there are differences between the way men and women value things and respond to them. For some feminists this is a gender problem, and women and men are simply socialized into thinking differently; for others it is that such differences are genetic. Which is the correct interpretation is irrelevant, however, since the fact remains that the feminine interpretation is consistently under-valued in relation to the masculine. Similarly, whether it be genetic or gender, it is generally females who hold the feminine perspective.

This suggests to some that women and men have different moralities. For men the morality is the `justice' or `rights' approach, for women it is an ethic of care and responsibility. These different moralities can be seen as being ways of dealing with moral conflicts and dilemmas. For women conflict may be perceived as a clash of responsibilities, for men it is a clash of rights. Women solve the problem by inclusion, men by judging the fairness of claims. Where women think contextually, men think categorically - for men aggression is the source of hurt; for women it is the failure of response which is the source. Women define themselves through their relationships of care and responsibility, men do it through individual achievement. Women see their relationships as web-like, for men they are hierarchical (Gilligan, 1984)[7].

What is being stressed is that the basis of responsibility is not the right of another (to fair treatment, for example) but one's connectedness to that other. It is a responsibility which is connected to friendship - the considerations of obligation and fairness arise out of this friendship, care, and love (Cheney, 1987). This has implications for the Eco-feminist perspective in terms of its regard for the standing of other species. Eco-feminists contest the Deep Ecologists' premise of biospherical egalitarianism as unworkable and abstract. This debate is of great significance for the development of the Green Paradigm, and is far from over.

> "Species bonds are real...And this, rather that some abstract judgement of value, does seem to be at the main

7 Gilligan does see this description of selves as being gender based, not sex-linked, although somewhat confusingly she uses the terms sex and gender interchangeably.

> root of that relative disregard of other creatures which has been called `speciesism'"(Midgley, 1984, p. 106).

There is both a positive and a negative side to the issue of species bonds. On the negative side, it is to be expected that a species bond between humans will naturally result in a form of anthropocentrism which could, although need not necessarily, militate against the nonhuman. On the positive side it provides a context for the question of a morally correct behaviour toward the nonhuman, simply because we are human and thus subject to certain moralities, moralities which will naturally include the caring and nurturing element embodied in the feminine. If the feminine is given equal status with the masculine, then one need not fear wanton destruction of Nature as presently occurs when anthropocentrism is equated with androcentrism. In other words the situation that presently holds is not simply anthropocentric - human centred, it is androcentric - male centred, and much of the problem lies in the equating of the two. This is not to deny that species bonds could be problematic, but:

> "Questions about the morality of species preference must certainly be put in the context of the other preferences which people give to those closest to them. These preferences do indeed cause problems. By limiting human charity, they can produce terrible misery. On the other hand they are also an absolutely central element in human happiness, and it seems unlikely that we could live at all without them. They are the root from which charity grows" (Midgley, 1984, p. 103).

What this says is that one of the most fundamental bonds - call it charity, friendship, obligation, or whatever - already exists in the human community. For some Eco-feminists the bonds between the human and nonhuman are natural and unbreakable, and are therefore subject to those same obligations as the bonds between humans. On the basis of this existing bond one can invoke the idea of equality to deal with special cases and difficulties which may arise (Zimmerman, 1987).

This is different to the perspective of Deep Ecology which begins from the premise of equality and then uses this to create the bonds. Instead the Eco-feminist approach allows for a differential moral regard, recognizing that it is simply not possible to care equally for all things. This categorization of caring is not a differentiation in the value of the object of care, it is a difference in care. The recognition that it is not possible to care effectively in all cases allows for differential moral regard, and this dictates differences of action, allowing one to be more concerned about one's immediate environment than a distant one, for example. An active response is possible in the case of close contact - under more distant conditions one tends to fall back on the abstract formulation of allowing equal rights to live and flourish. Either way, however, nonhuman nature is located in the ethical space of the moral community (Cheney, 1987).

> "Just as an answer to the question of what one's responsibilities are to one's friends is a highly contextual matter involving a detailed understanding of the precise threads of interconnectedness and intimacy involved, so an answer to what might be our moral relationship to the nonhuman environment depends upon (1) a complex understanding of what it is to be a human being, what it is to respond to another *as* human being (whatever that might turn out to be), and (2) an understanding of how those complex webs of relationships that constitute the human moral community might expand to include the nonhuman. This sort of expansion of the moral community is not the extension of moral privilege to nonhuman creatures just because they happen to resemble us in desirable ways (for example because they are rational, sensitive, or alive) - this, indeed, is moral arrogance. Rather, it is simply (or complexly) a matter of trying to come to an understanding of what it might mean to care, to respond to something in the non-human environment as a member of one's moral community" (Cheney, 1987, p. 139-140).

The argument is that if the distinction between humans and other animals is removed, then there is no standpoint from which to decide what is the correct action. It is contended that maintaining such a distinction does not create a moral hierarchy, instead it builds a moral community (Cheney, 1987).

> " The idea that all living things are morally considerable is pernicious when conjoined with the extensionist and atomist view that some are morally more significant than others. That it is all right for me to eat the carrot from my garden or the fish I catch is not because I am more worthy than they are; nor is it a function of the alleged fact that my interests have more value than the carrot's or the fish's. Rather, the issue concerns appropriate care, genuine, clear-sighted, sane, healthy responsiveness to a world I have come to know and cherish (Cheney, 1987, p. 144).

In recent years two distinct interpretations of the eco-feminist position have emerged; cultural eco-feminism, and social eco-feminism.

The *Cultural* group and those close to it stress the links between women and nature, and tend to regard the oppression of both as a consequence of masculine domination. In this interpretation masculinity is understood to form in terms of the separation from and control of women and nature, resulting in the creation of a society obsessed with control and domination. Attempts to remedy what is seen as a problem of patriarchy emerge through the creation of a women's culture; a celebration of the values oppressed by patriarchy; the feminine, the natural, the emotional. What is particularly problematic about this interpretation is that women are seen as having a superior relationship to nature; one that is often taken to be biologically determined. The suggestion is that only in a society where women can control the number and the influence of men will there be a respite from the destruction of nature and from social aggression. Taken to even further extremes some see this approach celebrating fertility and creativity through what amounts to a return to feminist paganism; the Earth Mother religion (Plumwood, 1992). In terms of its roots, much of this approach has simply accepted the assumptions of the DWEP; that women are closer to nature. Yet where the DWEP argues this implies inferiority, the cultural eco-feminists claim it implies superiority. This is not particularly helpful, because it is more a simple reversal of roles than a new formulation; the implication is that nature is superior to human, women are closer to nature and are therefore superior. Men remain permanently cast in the role of the oppressor.

Social eco-feminists, on the other hand, dismiss the suggestion that men are unchangeable, and that the sexes are biologically constrained in their relations with nature and with one another. Nor do they accept that women necessarily provide a role to affirm. Instead they argue that women are as much a part of the culture, and thus the problem, as men are. The existing relationship to nature, the DWEP, is a product of a dominant male culture; expressed through the dualism of nature and reason. Nature thus becomes a political, rather than a natural, category, and the task of the social eco-feminist becomes the creation of a less oppositional and confrontational approach to nature (Plumwood, 1992).

Certainly one of the most important and useful aspects of social eco-feminism is that unlike its cultural counterpart, it does not attempt to reduce all forms of oppression to women's oppression. Instead there is an appreciation that oppression of women is only one of a number of forms of oppression, and gender issues are a thread woven in with issues of class, race, and species. Thus in different relationships there are different positions of power; sometimes one is an oppressor, sometimes one is oppressed (Plumwood, 1992). This implies a recognition that the oppression of nature is an extension of human domination; gender structures and the domination of Nature are integral and mutually supporting components of the DWEP. Cultural eco-feminism assumes male attitudes of derogation toward females exist in the first place, and are then extended towards nature when this is seen as female. Social eco-feminism sees the human derogation of nature as pre-existing, and later being extended to women when they are regarded as closer to nature.

The issue of appropriate moral response to the nonhuman is far from solved, and Eco-feminism, as much as any other Green school, is involved in critical examination of the alternatives. One of the most valuable contributions that Eco-feminism makes is to point out that a model for a more caring society already exists in the presently undervalued feminine approach.

Gaia

The Gaia hypothesis is a view which has arisen within science itself, yet which accords with the minimal perception of the Green Paradigm - that the Earth is not centred around humans[8]. The hypothesis is that:

> "The entire range of living matter on Earth, from whales to viruses, and from oaks to algae, could be regarded as constituting a single living entity, capable of manipulating the Earth's atmosphere to suit its overall needs and endowed with faculties and powers far beyond those of its constituent parts" (Lovelock, 1982, p. 9).

The essence of the Gaia hypothesis is that the Earth is a self-regulating system, and could thus be regarded as alive. This dramatic interpretation of the human-nature relationship arose in a completely different sort of environment to the previous three articulations of Green thought, coming about as a result of normal scientific enquiry. In spite of this, it is developing along remarkably similar lines as people become more aware of its implications. Like the other Green formulations, the Gaia hypothesis is not a complete solution in itself.

Although it was given its structure, and its popular name, by Lovelock, it is not a recent idea. Like all theories, Gaia did not arise mysteriously out of a vacuum; its own roots lie deep in the history of Western civilization. In fact the idea of the Earth as a living entity was already being used in the early parts of this century by Aldo Leopold. Based on the work of the Russian philosopher P.C. Ouspensky (who regarded the Earth as a living being), this organicism was incorporated into Leopold's land ethic, and via this route into the Deep Ecology perspective from the very beginning (La Chapelle, 1981). It is particularly interesting that the idea of life itself forming a part of a feedback system had been suggested in philosophy long before Lovelock (1982) propounded his scientific hypothesis. In expounding Gurdjieff's teachings, Ouspensky (in Walker, 1957, 106) wrote: "Organic Life may be looked upon as being both the Earth's organ of perception and its organ of radiation". Indeed this primitive organicism was incorporated into Deep Ecology at an early date, but was seldom expounded, probably because Deep Ecology lacked the evidence and credibility to make such a claim. That it should later be made within science itself by Lovelock (an atmospheric chemist) is fascinating. The idea itself is in fact much older than even Gurdjieff's interpretation, and formed the original basis for the 'Mother Earth' concept. In his *Timaeus* Plato saw the Earth as an animal with a female soul, an idea expanded on an blended with Christianity in the Neoplatonism of Plotinus (204-27

8 This discussion on Gaia is held using the same types of language found in the literature on the subject, be it sexist, technicist, or whatever. This is done deliberately to impart the flavour of the discussions on the topic, and provide some indications of possible hidden assumptions.

AD), as well as by the twelfth century Christian Cathedral School of Chartres, which interpreted the Bible in conjunction with the *Timaeus*, and saw nature personified as a goddess, Natura. Nature was seen as the midwife to Ideas, which came from God, giving them material form (Merchant, 1980). Not only was nature in the generalized sense seen as female, but the Earth itself, as geocosm, was viewed as a nurturing mother. The geocosm theory compared Earth to a living human body, with breath, blood, sweat, and elimination systems. The Stoics, who lived in Athens from the third century BC and in Rome through the first century AD, also saw the world itself as an intelligent organism (Merchant, 1980). In his more recent book Lovelock (1990) notes that James Hutton introduced the idea of planetary physiology in the eighteenth century, and comments that the ideas about which he has been writing have been raised on numerous occasions in the past, but in general have been ignored; he specifically notes an empathy with the writings of Eugene Odum, and similarities with the Bulgarian philosopher Zivadin.

Gaia itself is a Greek word, the name given to the Earth goddess. It arose from the Greco-Roman sense of *thisworldliness*, a function of their outdoor lifestyles. It was a view which did not separate humans and nature, but which instead saw humans a children of Earth, sharing in her life and her Nature. Instead of the passive `environment' we have today, they saw the Earth as a goddess, a vast living being. Poetry of the Archaic Period tell how in the beginning there was the Earth, mother of the gods, people, animals and plants. She nurtured and cared for all creatures as her own children. All things arose from her, and all things returned to her when they died. She gave birth to everything that existed, including the sky and all the stars and planets it contains (Hughes, 1983).

The Greeks of the classical period retained the idea of a closeness to the Earth - to the extent of gathering their hair in clasps shaped like cicadas; insects which emerge from the Earth in springtime, in order to symbolize that they were children of the Earth, who sustained them. This happy relationship did not last. The Olympian religion suggested a multitude of warrior sky-gods, most of them male, and the Olympian view began to supplant the Earth-centred one. This resulted in a degree of linking between the two perspectives, in an image of sexual union. As god of weather, Zeus could send the fertilizing rain and cause the Earth to conceive. He could be the father, she the mother. This allowed the Earth to retain a place of importance in the religious system, and led to a reverence for places such as springs; where water flows from the ground like milk from maternal breasts. It has been suggested that the choice of location for temples, theatres, sports arenas, and healing centres was generally determined after careful observation of the area's geomorphology and the topographical features visible from the sites. It was intended that people visiting the places should be aware of the great natural beauty. What has also been noted is the shapes of hills, and notches on the horizon - suggestions of male and female sexual imagery, and this too played an important role in the selection of sites (Scully, 1969).

A particularly important aspect of the religious system was Gaia's closeness to another goddess, Themis. Themis was in fact her daughter, although in some parts of the religion the two were conflated into the same goddess. What is important is that Themis was goddess of law and justice - interesting characteristics to attribute to the Earth. The reason for this attribution was the Earth being seen to have her own, natural, laws, much more powerful and irrevocable than human laws. Those who treat the Earth well receive her blessings; those who treat her poorly suffer. The Earth will forgive, but only to the point where the balance tips; then it is too late. Famine, disease, and death come to those who tip the scales. It is this that reveals the Gaian perception on problems in nature.

> "For though she cares for all creatures as her children,...and provides food for every living thing, she also knows that the droppings of cattle manure her trees and the bodies of men are humus for the grass of the plains. At times she is arbitrary and violent; the volcano too is her voice. But in Gaia's revenge is no vindictiveness at all, only the deepest and most natural working. Those who learn and obey her laws have the best chance, in the words of the Homeric Hymn, to see `their sons exult with ever-fresh delight, and their daughters in flower-laden bands play and skip merrily over the soft flowers of the field. Thus it is with those whom you honour, O holy goddess, bountiful spirit'"(Hughes, 1983, p. 55).

It was only a small step from seeing the Earth as a goddess to seeing the Earth as alive. The worship of the Earth, whether seen as animate or personal, is a universal in human religion at some stages in human life. The idea of a living, sentient, cosmos; far from being an isolated idea among philosophers, is in fact a dominant theme (Hughes, 1983). Thus it was that James Lovelock, an atmospheric chemist, came to the same conclusion.

> "It appeared to us that the Earth's biosphere is able to control at least the temperature of the Earth's surface and the composition of the atmosphere. Prima facie, the atmosphere looked like a contrivance put together co-operatively by the totality of living systems to carry out certain necessary functions. This led to the formulation of the proposition that living matter, the air, the oceans, the land surface were parts of a giant system which was able to control temperature, the composition of the air and sea, the pH of the soil and so on as to be optimum for survival of the biosphere. The system seemed to exhibit the behaviour of a single organism, even a living creature. One having such formidable powers deserved a name to

match it; William Golding, the novelist, suggested Gaia - the name given by ancient Greeks to their Earth goddess" (Lovelock & Epton, 1975, p. 304).

Lovelock's Gaia hypothesis notes that both the compositions of all the reactive gases and the temperature of the lower atmosphere have remained relatively constant over the aeons, despite dramatic changes outside the system. The chemical composition has actually been kept constant in spite of the fact that the gases are not in chemical equilibrium. In a similar manner, while it generally agreed that total luminosity from the sun has increased considerably over the last four billion years, the mean temperature of the Earth has remained quite stable. The implication is that life makes its own environment (Sagan & Margulis, 1983).

In order to demonstrate this point, Lovelock produced the Daisy world model, invoking for the demonstration a mythical planet populated by nothing more than daisies. On this planet the daisies come in two colours, black and white, and are assumed to always breed true. Totally black daisies absorb all the light (albedo 0), while totally white daisies reflect all the light (albedo 1). The temperature optima for both daisies is considered to be the same - no growth below 5^{o} C, an optimum at 20^{o} C, decreasing to 40^{o} C at which point growth ceases.

The suggestion is that at lower temperatures the darker daisies will absorb more heat and thus grow faster in their local area than their lighter counterparts. At higher temperatures the white daisies will reflect more heat than the black, and will grow better. This argument has been developed to a significant degree mathematically, and leads to the conclusion that the changing rates of growth under the varying temperatures are sufficient to provide the beginning of a mechanism for global temperature regulation. The changing numbers of the different daisies actually control the temperature of the planet. From this it is concluded that an increase in the diversity leads to an increase in the regulatory ability of the system. Although Daisy World is only a model, it suggests that thermal regulation of an atmosphere could have an understandable mechanism. It also implies that other anomalies such as the near-constant salinity of the oceans, as well as the coexistence of reactive gases in the atmosphere may have similar regulatory explanations (Sagan & Margulis, 1983).

There is no point in reproducing here the arguments Lovelock uses to support his hypothesis; he does this admirably himself in his books and papers. What is interesting and worth reproducing are the descriptions and the implications of the hypothesis. For Lovelock, life and its environment are inseparable components of Gaia, including:

"1. Living organisms that grow vigorously, exploiting an environmental opportunities that open;

> 2. Organisms that are subject to the rules of Darwinian natural selection: the species of organisms that leave the most progeny survive;
>
> 3. Organisms that affect their physical and chemical environment. Thus animals change the atmosphere by breathing: taking in oxygen and letting out carbon dioxide. Plants and algae do the reverse. In numerous other ways, all forms of live incessantly modify the physical and chemical environment;
>
> 4. The existence of constraints of bounds that establish the limits of life. It can be too hot or too cold; there is a comfortable warmth in between, the preferred state. It can be too acid or too alkaline; neutrality is preferred. Almost all chemicals have a range of concentrations tolerated or needed by life. For many elements, such as iodine, selenium, and iron, too much is a poison, too little causes starvation. Pure uncontaminated water will support little; but neither will the saturated brine of the Dead Sea" (Lovelock, 1990, p. 40).

This sets the boundaries of what can be expected. The hypothesis provokes a view of Earth where:

> 1."Life is a planetary-scale phenomenon. On this scale it is near immortal and has no need to reproduce;
>
> 2. There can be no partial occupation of a planet by living organisms. It would be as improbable as half an animal. The presence of sufficient living organisms on a planet is needed for the regulation of the environment. Where there is incomplete occupation, the ineluctable forces of physical and chemical evolution would soon render it uninhabitable.
>
> 3. Our interpretation of Darwin's great vision is altered. Gaia draws attention to the fallibility of the concept of adaptation. It is no longer sufficient to say that `organisms better adapted than others are more likely to leave offspring'. It is necessary to add that the growth of an organism affects its physical and chemical environment; the evolution of the species and the evolution of rocks, therefore, are tightly coupled as a single, indivisible process.
>
> 4. Theoretical ecology is enlarged. By taking the species and their physical environment together as a single system we can, for the first time, build ecological models that are mathematically stable and yet include a large number of competing species. In these models increased diversity among the species leads to better regulation. (Lovelock, 1990, p. 63).

The purpose of this section is not to debate in great detail the scientific merits of the hypothesis; it is by no means universally accepted. Certainly there are assumptions in these quoted sections which have been queried earlier in this dissertation; stability, direction, and competition, for example. Instead it is to note that it is possible to adopt a Green approach to science; and that conventional science can lead to Green insights. The Gaia hypothesis does the latter better than it does the former. The Gaian theory forces the adoption of a planetary perspective; in arguing that it is not the health of individual species or organisms which matters, but that of the whole planet (Lovelock, 1990), the hypothesis has the potential to confront and defeat the reductionism which characterizes conventional science. The hypothesis arose in a scientific environment. The book *GAIA: a new look at life on Earth* was not intended to provide ammunition for `environmentalists', whom Lovelock has in the past characterized as `misanthropes' and `Luddites', people he saw as more concerned with destructive action than constructive thought. Lovelock has claimed that pollution, taken to mean the dumping of waste products, is as natural to Gaia as is breathing to ourselves (Lovelock, 1982), although a more recent comment on the same issue described pollution as the excretion of entropy and used the specific example of carbon dioxide exhaled by people and used by plants. Indeed, Lovelock was supported in his research for many years by the chemical industry, including Hewlett-Packard, the Manufacturing Chemists' Association, and other sectors of American industry. Very interestingly, the preface to the 1990 book begins with a description of the room in which Lovelock works; a room added to an old water mill, and which looks out on a river valley with its fields and hedgerows. The description, Lovelock feels, is crucial to an understanding of his work, because it demonstrates his independence. He laments the loss of the independent scientist; the fact that nearly all scientists are employed by large organizations such as governments, universities, or multinationals, the fact that:

> "they have traded their freedom of thought for good working conditions, a steady income, tenure, and a pension... constrained by an army of bureaucratic forces [and]... by the tribal rules of the discipline to which they belong" (Lovelock, 1990, p. xiv)

Indeed he suggests that he would have found it impossible to do full time research on the Earth as a living planet within the structures of a university, and that as a result he has been force to become "a radical scientist".

Gaia as a concept was siezed upon by all sorts of individuals, and used in a multitude of contexts far from the original intention. This is not to say that such use is necessarily incorrect - there are those who would see the hypothesis as a final recognition from science that it is not above the rest of life, an interpretation probably not what Lovelock had in mind originally, but then his present position too is far from his original one. The fact of the matter is that such a recognition by science must necessarily open the door for critique of science's relation to society and to nature. Such a critique should be seen as, and indeed should be, a positive move towards a more healthy relationship, rather than narrow-minded destructiveness. The Gaia hypothesis is an alternative to the unpleasant view which sees nature as a primitive force that has to be subdued and conquered (Lovelock, 1982). This, as is evidenced from the debate in Chapter 2, is a cutting critique of many perceptions of science. Significantly, it is embraced by many scientists, in papers with titles like *GAIA: a natural scientist's ethic for the future* (Hughes, 1985), *The Perceptual Implications of Gaia* (Abram, 1985), and *GAIA: some implications for theoretical ecology* (Goldsmith, 1988a).

The atmosphere, although regarded in conventional language as empty space, produced the first scientific evidence for the Gaia hypothesis. Interestingly, it is also providing a focus for Gaian based philosophical interpretations. For example it has been suggested that it is more correct to say that we live *within* the Earth, rather than on it, since we are at all times immersed in the air, along with the plants, animals, and mountains. If Gaia exists, then we are in her (Abram, 1985).

> "The Gaia hypothesis immediately suggests an alternative view of perception. For by explicitly showing that self-organisation is a property of the surrounding biosphere, Gaia shifts the locus of creativity from the human intellect to the enveloping world itself. The creation of meaning, value, and purpose is no longer accomplished by a ghostly subject hovering inside the human physiology. For these things - value, purpose, meaning - already abound in the surrounding landscape. The organic world is now filled with its own meanings, its own syntheses and creative transformations. The chaos of weeds growing in an `empty' lot is now recognized for its essential, almost intelligent role in planetary homeostasis, and now even a mudflat has its own mysteries akin to those of the human organism" (Abram, 1985, p. 98).

This quote is an example of some of the philosophical implication of the hypothesis; implications which are only now beginning to be considered. Lovelock, in recognizing these considerations, remarks:

> "Gaia is becoming visible, she operates through an automatic consensus of her constituents. She is as pitiless as an ICBM. She may not eat her children but she employs the market forces of natural selection to rid her Earth of the lame, the sick and the losers. I am sorry that my enthusiasm has unintentionally given to some readers the erroneous belief that a sentient Gaia looks after us like a nannie. She is in fact...a self stabilizing system comprising all of us living things and the environment as a single living dynamic entity.
>
> The science of Gaia portrays a stern and unforgiving entity; her existence like that of life itself depends on the strict rules that run the Earth. Without constraints there could be no life or Gaia. But there is rarely ever love without pain, beauty without discipline. The metaphor of Gaia is of a very lovely world where we also need ...

> encouragement, ... optimism, and ... thoughtful criticism ... to learn to live with her" (Lovelock, 1985 comment in *The Ecologist*, 15, (3) p. 95).

Nevertheless, even Lovelock is criticized for failing to recognize the implications of Gaia. His suggestion that Gaia could be exported to the surface of Mars, by and for humans, in order to create for them an artificial world, seems oblivious to the psychological ramifications of Gaia. Such a notion overlooks the extent to which Gaia questions the instrumental relationship people currently have with the world. The recognition of Gaia from within would greatly constrain the extent to which people can deliberately alter and manipulate the planet for their own ends. Gaia undermines the Cartesian dualism of classical science from a new, and fundamentally radical, perspective. If human senses, perceptions, and manner of thought have developed in a system of reciprocal coevolution with a coherent living biosphere, then people must recognize their perceptual imbeddedness in the collective life of the biosphere. Until this is achieved then any perception of other worlds will remain hopelessly distorted. Gaia cannot be reduced to formulae, it is our own flesh and blood, the wind blowing past our ears and the hawks wheeling overhead. Grasped thus, with the senses, and recognized from within, Gaia is far greater, far more mysterious and eternal than anything we may ever hope to fathom (Abram, 1985).

Gaia has also allowed new depth to critiques of the Dominant Western Environmental Paradigm by providing what is in effect a simplified theory of holism given in the language of modern science. It has provided justification for concern about broken linkages; and the enthusiasm with which the hypothesis has been grasped suggests that there were many scientists who harboured such concerns, yet who lacked a suitably scientific vehicle for expressing them. For example, at the conclusion of a discussion on the effects of industrialized societies on the composition of the atmosphere:

> "The dismal truth is that ecosystems are in disarray wherever we care to look. The Gaia Hypothesis has brought home to us that life in the planet is part of a unified system - the ecosphere - which if sufficiently deranged must inevitably transform into a new state of being. If we accept the notion of Gaia, then we must accept that life on Earth, through the process of evolution, has worked towards optimizing conditions and bringing about the regulation of physical phenomena so that such processes in turn will better support life. We, as one species, are threatening our own survival. The dying of the forests, the spread of the deserts, the death of the Baltic seals, the cycles of drought and floods are all indications of perturbations. Such perturbations may have underlying natural causes but their accentuation to the point of catastrophe is surely our own doing" (Bunyard, 1988, p. 206).

The Gaia hypothesis is also seen as having implications for the science of ecology itself. Ecology has changed from its original conception as being a science of communities. It has become increasingly reductionist and mechanistic - some go so far as to say perverted - in order to fit in with the dominant interpretation of nature. In its original formulation ecology was unacceptable to the scientific establishment and to the politicians and industrialists who sponsor it, and the change is both understandable and expectable. However, in its original formulation, ecology referred to the structure and function of nature (Odum, 1953) which in this interpretation could be seen as being co-terminous with Gaia (Odum, in *Pers Comm* to Goldsmith, 1988b).

Any discussion of the implications of Gaia for ecology must thus first define what it sees as ecology. Many Gaia theorist are confident, however, that although Gaia would not mesh too comfortably with ecology as taught at present, it is still likely to provide the foundations for a new ecology (Sagan and Margulis, 1983), one which would in many respects be a return to the old.

Following this line of argument, if the world is seen as a single self-regulating system, then progress through competition becomes fundamentally anti-evolutionary. Instead co-operation is seen as the true evolutionary strategy. This amounts to a rejection of the `survival of the fittest' maxim of Social Darwinists. It is the same rejection which characterized the anarcho-communism of Kropotkin. It implies a recognition that people can show a concern for the larger system of which they are a part. Gaia is thus the cornerstone of a post-Darwinian evolutionary system (Goldsmith, 1989). Gaia has created herself[9], not in a random manner, but in a goal-directed fashion, since the system is highly stable and capable of maintaining its stability in spite of internal and external changes. Such a perception is totally incompatible with Neo-Darwinism and Social Darwinism, and in fact negates it (Goldsmith, 1988b). Instead Gaia must be seen as a vast cooperative enterprise.

Conflict and Compromise

All of the approaches have weaknesses. Some of them were in fact developed specifically to address perceived weaknesses in others. There are, however, significant areas of overlap. It may thus be useful to consider some of these points, taking them out of their theoretical backgrounds and comparing them to one another in the hope of clarifying both the conflicts, and the frameworks themselves.

Much of the conflict seems to arise over what the correct focus of investigation should be. In essence, the four frameworks are in broad agreement that the present perception of Nature needs to change; that there must be more of a recognition that

9 The characterization of Gaia as female is common in this debate, and is introduced deliberately here.

everything is connected to everything else. The conflict between Deep Ecology, Social Ecology, and Eco-feminism is over what they see as the roots of the problem. The Gaia hypothesis does not concern itself with the roots of the problem; which is in itself a problem with the hypothesis. The differences in opinion and focus of the four articulations should not be unexpected, by the very nature of paradigms. If a paradigm shift is a sea-change in the consciousness of an age (Ogilvie, 1981), then it is only to be expected that there will be different foci of that shift. What is more important is to decide whether such different foci are compatible, or if they are mutually exclusive.

Deep Ecology has come in for some detailed criticism, more so than the others. This may simply be a reflection of the popularity of the approach rather than any weakness of the approach itself. The first and probably most fundamental charge that is laid against Deep Ecology is that it has no explicit social analysis. In other words, people (notably Social Ecologists and Eco-feminists) suggest that Deep Ecology does not adequately address issues of class, race, imperialism, bureaucracies, and injustices which characterize human society. Instead Deep Ecology lumps everybody together in a bundle of `humanity', presuming them all to be equal when they are not, and then accusing humanity of anthropocentrism. The criticism is justified, Deep Ecologists have taken such an approach, but as they point out in their defence, humanity is all one species. It is argued by Deep Ecologists that such an approach is a necessary step if one is to see the global picture of a species enjoying a population boom and technological planetary domination. The perspective also allows an easier grasp of the consequences of such domination. From the larger perspective, Deep Ecologists claim, it does not really matter what the "petty political and social arrangements are that have led to our ecological crisis, or even what dire consequences those relations have had for certain individuals, types, nations, or races" (Sale, 1988, p. 672). What really matters is to understand the total effect on the planet. This is not, Deep Ecologists claim, to suggest that the social dimension is absent from the Deep Ecology philosophy. Many Deep Ecologists are quite explicit about the evils of the DWEP and the need to challenge it, but Deep Ecologists think in biotic, rather than social, terms. For them the fundamental issue is the destruction of Nature and the suffering of dying species and ecosystems; which is seen as a different focus to those who see the basic issue as the absence of justice and the suffering of human populations (Sale, 1988).

A second problem relates to the contentious suggestion by some Deep Ecologists that a significant reduction in the Earth's population is necessary for the proper balance and functioning of the biosphere. Deep Ecologists are here accused of being Malthusian and claiming that there are not sufficient resources to feed everyone. They are also accused of eco-facism, since it is assumed they target the poorest, darkest, and sickest.

The question of who is to die would obviously be a tricky one, and one which quite rightly concerns the Social Ecologists.

It is fortunately not a question which need be asked at this stage, since Deep Ecologists are far from embarking on genocidal campaigns. There is some measure of agreement that there is more than enough food to feed the world's population (Lappe and Collins, 1977; Tokar, 1988), if suitable political and economic measures were taken to ensure its distribution. Instead what is suggested is that maintaining the present population will put too much strain on the resources of the planet, including other species and ecosystems. There is concern that the biosphere might not survive, and it is suggested that a reduction of population might ease the pressure somewhat. This is envisaged as a voluntary and gentle decrease, not a campaign to starve or sterilize the poor (Sale, 1988)

Deep Ecology has already acknowledged that it is weak in the area of social and economic critique, but in being so it fails to recognize a significant point - consumption is linked not only to population, but to the availability of consumables, and this availability is a function of economic power. It is for this reason that the USA, with only 6% of the world's population, can consume some 30-40% of its resources. Consumption is the real problem, which is why the whole idea of `green consumerism' is fraught with difficulties and contradictions. The point is not so much what is consumed, but how much. The majority of Deep Ecology theorists live lives of voluntary simplicity, and are aware of the problems of consumption, but this is not sufficiently clear in the literature. There is almost an automatic assumption that the problem will sort itself out if more people come to appreciate the Deep Ecology position. The focus of the debate has in fact shifted away from the population problem in recent times, but a misinterpretation of Deep Ecology's position on the discussion cost it much support. Deep Ecology is almost dismissive of a structural or social critique; a feature symptomatic of a number of other `environmental' initiatives (e.g. Integrated Environmental Management, Environmental Impact Assessment) which tacitly accept the social status quo. Social Ecologists have a very valuable point in the assertion that previous social aspects caused the present ecological problems, and that dealing with these ecological problems will create further social impacts (Lavrov, 1989).

A third criticism of Deep Ecology relates to the issue of biocentric egalitarianism; in other words to the place of humans in the world. By relegating the welfare of humans to a status secondary to that of the welfare of the biosphere, Deep Ecologists are accused of inverting the domination of humans over nature, and replacing it with a domination of nature over people. Deep Ecologists, it is said, are essentially misanthropic - they hate or distrust people (Bookchin, 1987, 1988).

This really is not true. One of Deep Ecology's fundamental principles is that it seeks to allow people an opportunity for Self-actualization, because it sees the survival of the biosphere as proceeding from such a position. Certainly some Deep Ecologists have made naive statements (which have been criticized by other Deep Ecologists, among others), suggesting for example that AIDS might be a welcome development in that it might reduce the population strain, or that starvation in Ethiopia was only to be expected given the population growth in relation to the productive capacity of the land (Foreman, in Devall, 1986). Such statements, however, are defended as being descriptive rather than prescriptive, and are intended to suggest that the Earth might have it own defence mechanisms to protect it from any rampant species. They do not qualify, Deep Ecologists feel, as misanthropic (Sale, 1988). It has been suggested that a readiness to equate opposition to human-centredness (anthropocentrism), with an opposition to humans *per se* can in fact be interpreted as a function of the dominance of the anthropocentric view of society. It is committing what has been called the fallacy of misplaced misanthropism (Fox, 1989).

Much of the conflict is not at levels of intellectualization; it is in actualization, and the debate is not as global as it at first appears. Indeed most of the polemics are confined to the United States of America. Earth First! is an activist group in the USA which developed amidst the frontier ethic of the West coast. It is characterized by direct action such as the spiking of trees to prevent the logging of certain forests[10], and the sabotage of what they see as `environmentally' irresponsible projects (Tokar, 1988; Manes, 1990). Many of the actions are undertaken in what can only be described as a highly militaristic style, with camouflage outfits, balaclavas, and other gung-ho paraphernalia. Earth First! (the exclamation mark is a part of the name) claim Deep Ecology as their underlying philosophy, and produce a journal in which many leading Deep Ecologists frequently write. Earth First! have made several contributions to `environmental' activism, siezing public imagination and allowing more respectable activists to take much stronger stands than they would otherwise have been able. In addition they regularly put themselves on the line for their beliefs, and openly confront the failings of established institutions. But as Tokar (1988) puts it:

> "Ideological consistency has never been very important in America, however, and Earth First! has always flaunted its nasty underside. Alongside poetic appeals for the integrity of wild nature, writers in the *Earth First!* journal

10 Spiking is the practice of driving long nails in to the trunks of trees. If undetected by the loggers, these nails will destroy saw blades and other logging machinery, and can cause injury.

> have tended towards a rather grim and brutalized view of human nature. They have railed against Native American hunting practices and primitive agriculturalists and touted AIDS and famine as `natural' cures for human overpopulation. They have censored anarchists and feminists and provided a platform for neo-survivalists, behaviourists, and outright misanthropes. Freely mixing pseudo-scholarly tomes and spit-in-the-can barroom philosophy, there is something in *Earth First!* to offend just about anyone"(p. 134).

On the other side the emotional tirades of the Social Ecologists offer no hope of reconciliation; attacking (frequently justifiably) the writings of the Deep Ecologists, and at the same time committing many of the same errors of presentation. It is a feature of the naivety of the American political landscape discussed more fully under the earlier investigation of Deep Ecology. Compared to the level of debate in a highly politicized society such as South Africa's, the Deep Ecology-Social Ecology debate as it is generally presented in the United States of America appears intolerant, petulant, and destructive. One of its potentially most damaging features is that it is holding up theoretical work on the issue in the USA, and newcomers to the field are being forced to take sides where no sides should exist.

There are certainly problems with both the approaches, but the level of debate is not adequate to deal with them. The Earth First! approach is internally ideologically inconsistent, blending rugged individualism and militarization with a Deep Ecological philosophy. Similarly, many supporters of Social Ecology clings to the Marxian notion that technological progress is a prerequisite for a liberation of humanity, unconsciously linking themselves to the nineteenth century idea of nature as something from which liberation was necessary. What is needed here is tolerance and communication, because the perspectives are not necessarily mutually exclusive; there is common ground. The participants in these debates need to stop shouting long enough to hear what the others are saying.

The Eco-feminist critique of Deep Ecology has been defined in two separate ways: firstly, that Deep Ecology is in itself somehow androcentric (male centred), and secondly, that Deep Ecology focuses on anthropocentrism when it is androcentrism which is the problem. Deep Ecologists attempt to defend themselves from the first charge on the grounds that they argue for a cosmological basis for Self-identification. In other words, they suggest that in a lived sense all entities are leaves on the tree of life. Identifying with the tree must, they feel, lead to impartial identification with all the leaves. They suggest that this is a more reasonable method than that proposed by the Eco-feminists of extending love, care and friendship outwards from the self in ever widening circles; *my* self, *my* family, *my* species, and so on. Such an approach, they fear, looks more like a potential cause of possessiveness, war, and ecological destruction (Fox, 1989). The Deep Ecologists response is valid, but it does not solve the problem the Eco-feminists raise; that of identifying the other entities as themselves. Including them in an ever-widening sense of Self need not grant them any standing in their own right, and does not answer the criticism. Neither position is completely tenable on its own.

The second criticism raised by Eco-feminists, that Deep Ecology focuses on anthropocentrism when it is androcentrism which is the problem, is felt by some Deep Ecologists to be a more serious charge. An important point is raised during Deep Ecology's defence; that there are two essentially different tasks which all these articulations of the Green Paradigm need to address. The first is the negative or critical task of dismantling the DWEP, and the second is the positive, constructive task of encouraging a healthier attitude towards the rest of the world (Fox, 1989). The failure to appreciate this distinction, and the conflating of these two has resulted in much unnecessary confusion.

Deep Ecology defends itself from the charge, which it perceives as directed at Deep Ecology's critique rather than its ideal, by agreeing that men have indeed been more implicated in the domination of nature than women. But by the same token they note that capitalists, whites, and Westerners have similarly been more to blame than their counterparts - pre-capitalists, blacks, non-Westerners. They then question the validity of the Eco-feminist criticism, suggesting that it is simplistic to think that one particular perspective can be identified as the real root of ecological destruction. Similarly, they suggest that it is implausible to suppose that simply altering that one root will result in a society which has a better relationship with Nature. Social Ecology, particularly the Bookchin approach, can be cited as an example of the failure to recognize this important point. The main hypothesis of Social Ecology, and similarly of Eco-feminism, is that a society will live in harmony with nature because its members live in harmony with each other (Bookchin, 1982). In support of this, it is suggested that it is possible for a society which lives relatively benignly in regard to its environment to be very oppressive internally, the roots of eco-facism. The Social Ecologists and Eco-feminists, in the opinion of Fox, miss the obvious corollary; that a society which is internally egalitarian could easily be environmentally exploitative (Fox, 1989). While Fox has a very important point here, it is not certain that he is not also committing the error of confusing the positive and negative tasks of both Eco-feminism and Social Ecology. It is his contention that these approaches argue, in essence, that `Since the real root of our problem is androcentrism or capitalism, for example, we must first get our interactions between humans in order (for example with gender issues, wealth redistribution, etc) and then everything else, including our relations with Nature, will correct themselves'. It is certainly an approach which is taken by some of the advocates of these approaches, and it is obviously a simplistic and insufficient one. Nevertheless, Fox ignores the positive/negative dimension to these approaches. While as critiques they are obviously insufficient, they do provide models for society. Deep Ecology can provide a more consistent critique, but in its biospherical egalitarianism it provides a poorly developed and rather inaccessible model of a society. Similarly, Deep Ecology necessarily presupposes human equality in its biospherical egalitarianism, and would thus have to follow on from a Social Ecology and Eco-feminism, because it contains little social analysis and is insufficiently developed in this regard to attempt to correct social imbalances. Deep Ecology correctly points out that anthropocentric concerns have typically been used as a source of legitimation of human domination, regardless of the structure of the society at the time - it is always `for the good of humanity'. Deep Ecologists feel that by removing such legitimation from whatever class of social actors is dominant at the time, they can short-circuit the whole process of domination; whether of one group by another, or of nature by humans (Fox, 1989). It is a bold claim, and one which would be hard to prove. It does also not remove the need for Eco-feminism nor Social Ecology; they are intimately and inextricably linked. Both Social Ecology and Eco-feminism recognize that society is a natural product of a natural species, and that it thus must be presumed to have a function. It is possible that they err in trying to impose a human-oriented model of society on Nature, but in doing so they raise an important point. Only when all the social actors are equal can Deep Ecology truly implement its biospherical egalitarianism, and when it does so it will be along the societal lines as proposed by Social Ecology and Eco-feminism. Far from being antagonistic approaches, Deep Ecology, Social Ecology, and Eco-feminism must be seen as being fundamentally complimentary. Their differences are not so great as to be problematic, and their disputes are sufficient to ensure continual soul-searching and logical rigour on the part of their acolytes.

The Gaia hypothesis is a particularly interesting arrival on the scene. In many ways it is born out of conventional science, with all the problems which accompany such a birth. It is totally unashamed of its psycho-sexual roots, openly discussing the Earth as `she', and drawing its own links with Earth goddesses and other mythical perceptions. In this regard it has made little progress from the perception of `nature as female' which was a feature of science several hundred years ago, and which resulted, at least in part, in the killing of thousands of witches. Yet such open acknowledgment may unconsciously be introducing a new perception; that the female side of life is being granted increasing status even in that most masculine of pursuits, science.

In a similar and equally unintentional challenge to conventional science, the Gaia hypothesis effectively undermines reductionist, atomistic, normal science by suggesting that everything is, as people have been saying for years, connected to everything else. Under the Gaia hypothesis it is no longer sufficient to study pieces of the system in isolation, because there is no meaning in isolation. It is the connections that are as important, if not more, than an isolated entity. In fact to some extent there can be no isolated entity, because every entity must necessarily be a part of the whole, of Gaia.

The Gaia hypothesis has very conventional roots, and yet is in some ways far more radical than any approach yet considered under the Green Paradigm. Not even Deep Ecologists suggest in any seriousness that the Earth is a living organism, even though the idea has been a part of Deep Ecology's source literature for more than a century - Gaia states it quite matter-of-factly. Even so it is not absolutely necessary to see the Earth as such to appreciate the insight of the hypothesis. A perception of the Earth as a self-regulating system, whether such a system has its own life or not, is an invaluable contribution to the internal coherence of the Green Paradigm. That it should emerge from conventional science, even if it is not universally accepted (given the constraints of the DWEP this would be rather unlikely), certainly suggests that it may suffer from some of the limitations of such science, but it also indicates a growing awareness, even here, that there are problems with the DWEP.

The full implications of the Gaia hypothesis have yet to be explored, but there is certainly room to argue for increased appreciation of the social dimensions of human-nature interactions. Social Ecologists suggest that society is an evolutionary adaptation, for example. Gaia, although coming from physical-science roots, is going to be faced with discussing such suggestions and their implications. At the very minimum the Gaia hypothesis removes human actions from the world of the abstract and places them within a context. It replaces the *otherworldly* perception of the DWEP with a *thisworldly* one, on grounds which, curiously enough, satisfy the verifiability demands of the old paradigm.

Similarly, given that humans are an important part of the life of the planet, Gaia will have to address issues of the most satisfactory form of society for the long-term survival of the species. If human society is an evolutionary adaptation, then it is not unreasonable to suggest that the form of society itself will evolve and develop over time. The crumbling of the Berlin wall, for example, ceases to be an isolated accident of history and may be a feature of the progress of world society toward a new, more understanding, form.

In some ways Gaia is an acknowledgement by at least part of science of the truth implicit in the Green Paradigm. As such it provides unexpected, and at this stage largely unappreciated, support for those already working under the new paradigm. Gaia obviously lacks a social critique, and, with the gaucheness of old science, seems only vaguely aware of the importance of one. Social Ecology, Deep Ecology, and Eco-feminism have developed in the arena of the social sciences and philosophy; their scientific roots are as poorly developed as Gaia's social ones. Because they have come from different ends of the spectrum, however, does not mean that they are antagonistic. Far from it; they should be seen as complimentary. It has already been noted, for example, how the Gaian concept of pioneer and climax ecosystems, when applied to human society, bears a strong similarity to the Eco-feminist proposal for a society more in touch with itself; one not out to conquer. It should be expected that more and more of these similarities will emerge. Brought together, the science of Gaia, the philosophy of Deep Ecology, and the social analyses of Eco-feminism and Social Ecology provide a strong, internally coherent, and most importantly a reasonable framework with which to view the world.

Chapter 6

Drawing It All Together

Introduction

Although the millennia have given the Dominant Western Environmental Paradigm a certain degree of authority, indeed almost an inevitability, it can be understood best as a cultural paradigm, as an artificial construct. For people born into, and socialized in, the paradigm, it takes on an air of correctness - it seems to be the way things are, simply because that is the way things are. To challenge it is like a goldfish trying its challenge its bowl - the most difficult part is discovering the bowl in the first place.

The paradigm concept is a tool for discovering the bowl, the limits and barriers which shape perceptions of the human place in the universe. As such it is an enormously useful implement. In particular, the cultural paradigm, as used here in the example of the two paradigms which shape interactions with Nature, allows the identification and comparison of fundamentally different value systems which could otherwise not be identified, since they both form part of the Western *cosmology*. It also raises the question of the validity of approaches which take for granted that agreement exists on a single approach to issues such as relations with Nature. An approach predicated on the values of the Dominant Western Environmental Paradigm would not necessarily hold under the Green Paradigm, for example. It has been suggested that the Green Paradigm is a more appropriate cultural paradigm for society than the DWEP, and that if geography is to address the ecological stress imposed on the planet by human activity it too will need a new paradigm shaped within the larger framework of the Green Paradigm. Within the DWEP geography is constrained and fragmented, falling short of its potential as an integrative discipline. As a whole the discipline suffers the same fate as much of science; it is commodified and colonized. Arguments are de-contextualized and rendered ineffectual. The subordination of science to economics simply means that scientific arguments which challenge the assumptions of economic expediency within the DWEP need not (and generally are not) be taken seriously. Yet the assumptions of the DWEP have been shown to be, in many cases, mistaken, inappropriate, or inadequate. There is thus no logical reason, beyond simple expediency, for geography to remain bound to those assumptions, and to be forced to frame its findings in a way dictated by them. The Green Paradigm offers a more internally coherent and consistent set of assumptions, and a geography based on a disciplinary paradigm framed within this cultural paradigm would be far freer to be truly integrative and holistic. Indeed many of the articulations of the Green Paradigm discussed in the previous chapter offer potential frameworks for analyses, or are in themselves valid areas for geographical enquiry.

It is suggested that a cultural paradigm must be identified from evidence collected in several fields before it can be declared a paradigm. It would not be sufficient, for example, to declare that camels are the only entities of value on the planet and that all systems henceforth must operate on this assumption, since the is no agreement on the notion, no evidence of support for it. Both the Dominant Western Environmental Paradigm and the Green Paradigm were identified from the literature - in some way they are a sort of average or lowest common denominator of agreement of two very distinct schools of thought. The cultural paradigm concept is simply the categorizing tool which allowed them to be uncovered.

This analysis has proceeded in a deliberately non-reductionist manner. The `environmental crisis' has been regarded as a collection of various manifestations of a larger problem, rather than as a multitude of peripherally connected sub-problems. This has led to a search in the direction of larger and more overarching causes of the central problem, rather than a reductionist search for minutae. The result is a different conception of the roots of the problem. Third World debt, for example, while obviously a factor in the ecological stress, is not regarded as a significant final cause, but as a manifestation of another relationship. The real roots of the problem, it has been argued, lie in the interconnections and overlaps of prevailing attitudes, axioms, and assumptions from a number of very different fields, rather than in specifics such as balance of payments problems or the production of CFCs. The different conception of the causes of the problem places a different research agenda before those who wish to deal with it. Comments such as that reported on the news this morning "President George Bush has stated he will not sign an undertaking to reduce emissions of greenhouse gases if American jobs are at stake" (South African Broadcasting Corporation, 25 March 1992) can be regarded in a rather different light.

This statement is a classic example of the implications of reductionist analysis of the problem. It is argued that such an approach is the almost inevitable result of the contextualization of the problems through the framework of the DWEP. Reducing the `environmental crisis' to a collection of specifics necessarily precludes the examination of the real causes of the problem, the DWEP itself. A geographical paradigm which is framed within the DWEP limits its field of analysis to a point which falls far short of the conceptualization of the real problem, the larger paradigm.

Summarizing the DWEP

The Dominant Western Environmental Paradigm has identifiable roots and identifiable assumptions which go with those roots. In many instances it has been shown that the interpretations of the contributions made by some significant figures in the history of the DWEP were themselves constrained by the paradigm. In other words, people heard what they wanted to hear, rather than what was said. Indeed, many of the attitudes and beliefs characteristic of the DWEP are based on misinterpretations of historical points of view. Others are based on a simple extrapolation of historical trends, without any examination of the historical conditions which may have been responsible for the trend. The emphasis placed on growth within the DWEP is a good example. Little is done to define growth, nor to explain its apparent necessity. After analysis, it can in fact be demonstrated that the equation of progress with growth is as a result of an uncritical extrapolation of, among other things, the historic observation of population growth, something until very recently seen as desirable (Easterlin, 1974), not least because it too indicated an increased potential for the control of nature. When a continually growing populating came to be seen as less desirable, the growth aspect was retained in the abstract, and attached to the economy, resulting in the present equation of growth with development. Others roots of the DWEP are less well recognized; like the psycho-sexual roots of the assumptions, and the resulting tradition of genderism which has underlain the paradigm ever since. Much of the DWEP consists in ideological baggage left over from the nineteenth century. Yet the cultural paradigm is more than simply the sum of its constituent assumptions; its use as a framework brings with it goals and actions appropriate to that framework. It is active; it provides the measure by which people judge their actions and the actions of others. It provides a sense of direction. Yet the combination of assumptions which make up the DWEP, while mutually supporting, do not lead toward a healthy relationship between human and non-. It would probably not be an exaggeration to say that the `environmental crisis' is the inevitable result of the process of working through the assumptions of the DWEP. Some problems can be dealt with, some facets improved or ameliorated, but the process of domination of Nature continues unabated as long as the DWEP provides the guiding assumptions.

Conclusion

The Dominant Western Environmental Paradigm has come to rest on a tripod of reductionist science and technology, on domination and power as central, if abstract concepts, and on conventional economics. The assumptions of these fields have been internalized by supporters of the DWEP as being the correct approach to relations with Nature. The principles of science; its universalism, analysis, objectivity, and reductionism have been accepted as an appropriate framework through which to view Nature. Domination and rule by force has a long history in the DWEP; the Egyptians have been mentioned several times, and the stress on European agriculture caused by the militarism of Rome was remarked upon. Exploitation and abuse of human and non-human Nature is a common feature of the DWEP. `Environmental' problems are by definition social problems (in that it is the *human* environment to which one is referring), and the responses to these problems require yet more social action; the social-environmental link is unbreakable, but is frequently ignored in the reductionist mania of the DWEP. This reductionism has not only alienated people from nature, but from Nature; from themselves. An inability to see this alienation, which has been characterized as a social limit to growth, is made obvious in the problems encountered in low-income inner city ghettos. Symptoms of the alienation, and the inappropriate relationship with nature, occur with such frequency as to be labeled under a generic `environmental crisis'. The conventional technique for dealing with such crises, the "planned scarcity synthesis", may be expected to be rerun increasingly frequently in order to deal with the multiple manifestations of the crisis. It would seem reasonable to assume that there is a limit to the frequency with which such a tool can be used before it becomes ineffective.

A cultural paradigm is socially determined, and is socially manifested. The alienation characteristic of the DWEP is manifested in, for example, the simplistic equation of development with growth. It is a tapestry which has been woven over several millennia, and which has culminated in the strength of Western industrial and post-industrial society. By the same token the fundamental tacit assumption of the approach, that the world is there simply for human use, comes without one shred of supporting evidence.

Summarizing the Green Paradigm

The Green Paradigm has an equally long history. It is more than simply the negation of the dominant; it is a different picture, the atomic reality of the old paradigm, contrasted with the multi-dimensional nature of the new. In some ways the Green Paradigm marks a return to many of the goals of the original pioneers of the DWEP, it is in many ways a search for meaning. Smuts (1926) described the progress of societies as an evolution, as a necessary part of a philosophy of freedom. It is incorrect to see the Green Paradigm as simply a response to the crises of the DWEP, although this is certainly a factor in its present re-development. Alternative perspectives have always existed, however, and it would be wrong to confuse their re-discovery with invention. The Green Paradigm asks many of the same questions as the DWEP; these, after all, are fundamental questions in most human societies, and are integral in shaping relations with nature: what does it mean to be human? what is the human role on Earth? what is evolution? what is progress? It comes up with very different answers to those of the DWEP. These are the questions which shape science and society, and they are of more than passing concern to geography. Humans are patently not the masters of the planet. We certainly have the ability to modify it considerably, but this ability is out of all proportion to our ability to understand the consequences of such actions. Weather control, which was a term bandied around quite commonly in the 1960s, has been replaced with a more realistic appreciation that even weather prediction more than a few days into the future is all but impossible. Evolution is obviously more than the selection of random genetic mutations, and progress is a value-laden term which can no longer be taken to mean a move towards increased control over nature and an entrepreneurial lifestyle. Green thinking is not a rejection of technology, nor a cry for a return to cave dwelling. It is a rejection of unsatisfactory answers and their replacement with a new set which appear to fit reality in a more satisfactory manner. It is also the result of such a replacement, because the act of changing the accepted answers to those central questions has enormous implications in itself.

For the supporters of the Green Paradigm, development is the production of appropriate responses to conditions in one's environment and the fulfillment of genuine human needs. It is a freeing of human potential. A far cry indeed from the quantitative and exponential increase in GNP, although, of course, harder to measure. Ideas central to the Green Paradigm are gaining support rapidly, not least because they are able to accommodate some of the insights of the leading edges of science. This does not mean there has been a revolution or a cultural paradigm shift, however; there has not. The Gaia hypothesis, ecology, relativity, holism, quantum mechanics, and chaos theory all support the contention of the Green Paradigm that people are not the centre of the universe. So too do the looming ecological crises, the direct result of the notion that people are only accountable to other people for their actions. The Earth itself, it appears, demands to be taken into consideration.

One of the more interesting implications of the Green Paradigm is its social critique and ideal. This is more than wishful thinking tacked on by bandwagoning activists, it is an integral part of the Green perception. If humans are seen as a part of Nature, then society must be `Natural'. If people are going to alter their relationship with Nature into a less exploitative one, as they must do if they accept the insights of the Green Paradigm; as they must if there is any real hope for long-term sustainability, then inter-human relations must equally change to a less exploitative system. There can be no possibility of a healthier relationship with Nature until inter-human relations are healthier, simply because Nature includes people. There are historical examples of very unequal societies which still operated close to nature - the slave economy of ancient Egypt, for one. Nazi Germany too attempted to emphasize its closeness to nature (Bookchin, 1988; Bramwell, 1989). Both population and technology, however, have advanced in the intervening period, and the global consequences of such an exploitative society has become obvious. Technology today allows an individual the possibility of almost infinite consumption, and as the world human population moves closer to being a single society, the effects of one group consuming an increased amount will become more readily noticeable in the decreasing opportunities for some other group. By the same token the acknowledgement of the close interconnection between people and nature may encourage people to recognize the even less accidental link between people, the interconnection between overdevelopment in the First World and underdevelopment in the Third, for example (notwithstanding the paradigmatically different interpretations of development, of course). Or the continual undervaluing of the feminine experience of life.

It is important, given that this dissertation accepts the existence of both relative (Ricardian) and absolute (Malthusian) scarcity, to appreciate why eco-facism, as exemplified in Hardin's `lifeboat ethic', is not a response appropriate to the Green Paradigm. It has been suggested by some that there are potentially two solutions to Schnaiberg' ecological synthesis presented in the first chapter; an eco-socialism and an eco-facism. Both may advocate ecologically sensitive technology characterized by decreased commodity consumption and more labour intensive production (Lee, 1989), yet only one would fit within the Green Paradigm.

Hardin's argument in *The Tragedy of the Commons* is that a rational herdsman is rational in the sense of maximizing his own benefits while minimizing his own costs, and that on a shared common this means the sensible course for each herdsman is to add another animal to his herd, thus each seeks an unlimited herd on a limited resource base (Hardin, 1968). Herein lies one of the few recognitions within the DWEP that absolute scarcity may exist. Yet framed as it is within the assumptions of the DWEP, the conclusion is pessimistic, something which in itself suggests the inability of the framework to incorporate the argument. What Hardin has done is to define rationality in terms of egoism, a reductionism with obvious links to that of Neo-Darwinism and sociobiology. His argument hinges on the axiomatic assumption that to be rational is to operate in one's own immediate self-interest. Actions which would suggest even enlightened self-interest (to remain within Hardin's egoism), or a conduct which includes altruistic behaviour (to move outside the egoism) are simply assumed to be irrational, for no reason at all (Lee, 1989).

The extension of these axioms to the issue of absolute scarcity produces interesting results. There is a concentration by theorists like Hardin and the Ehrlichs on Malthus' population question, a concentration which has led to the formulation of the zero-population growth doctrine discussed in chapters three and four. Framed within the power relations which characterize the DWEP and the present state of the world economy, this has led to the situation where it is argued that countries which are not making serious attempts at curbing population growth should be abandoned as hopeless; an argument which avoids issues of social and economic injustice which characterize relations between the First and Third Worlds (Bookchin, 1980; Pepper, 1984). Yet the implication of this assumption is that the poor of the world are required to sacrifice their existences in order that the rich may maintain their lifestyles. Taken to an extreme this would suggest a society controlled by a dominant social group with a subordinate group carrying out its orders, and ending in an Egyptian type of situation with a slave society; benign in its relations to nature, but internally very unjust. Yet such a society would necessarily have to be constructed on the assumption that some form of superiority of a group is justified. The web image of the Green Paradigm, which suggests that regardless of one's individual prowess or merits one remains a part of a greater whole, would not justify the domination of one group by another. Where eco-facism emerges based on the recognition that absolute scarcity exists and uses this to justify the creation of an unequal social system, the Green Paradigm is based on a different set of axioms at a different scale. Eco-facism is a response to a perceived problem, the Green Paradigm is a formulation which would lead to a completely different situation by in effect altering the course of the society further upstream. Under the Green Paradigm, that the particular set of circumstances to which eco-facism is a response, would not have occurred in the first place.

A number of issues have been raised in the course of this dissertation. Not least of these is whether there is any validity in the paradigm concept, and assuming there is, whether the dominant Western environmental perception can be classified as a cultural paradigm and legitimately contrasted with a Green paradigm. By the same token, the question of whether the Green Paradigm exists at all can be raised - is it a cultural paradigm, or is it merely an ill-conceived attack on growth launched by Luddites, misanthropes, and leftists with their own axes to grind? The evidence seems to suggest that it is more than this, that it is at least as legitimate and internally consistent as the DWEP. The cultural paradigm concept itself, whether it is an artificial category arbitrarily imposed on a society or not, appears to hold great potential as a comparative and explanatory tool.

If these premises are accepted, they bring with them a number of implications, for science, for economics, and for the structure of society. The theoretical articulations that exist within the Green Paradigm are in their infancy, but can be expected to have an increasingly important influence on the structure of society. Deep Ecology points out the domination of nature by humans, Social Ecology points out how some social structures, like bureaucracies, are used to dominate Nature (both human and non-), and Eco-feminism highlights how the feminine experience of life has been consistently undervalued throughout the whole period of the pre-eminence of the DWEP. Deep Ecology, particularly in its most recent formulation as Transpersonal Ecology, places significant emphasis on sense of place, and it is suggested by supporters of this viewpoint that Self-realization is achieved through identification with ones surroundings, rather than by abstraction from them. From Social Ecology comes a key ingredient of the Green Paradigm: given that a paradigm is socially interpreted, the alienation of the DWEP was in many ways symptomatic of the excessive reductionism and the reliance on quantifiable data, at the expense of social relationships. An acknowledgement of the interconnection of human and nature means that social circumstances are at least as important as quantifiable data in understanding the whole. This implies an imbeddedness of social relations in the web of nature, creating an interconnection, and simultaneously a responsibility on everyone, not to damage the web for selfish reasons. The implications of this imbeddedness are significant; potentially any action becomes a political action, since it has social impacts at some stage or another. Science and economics, areas which often claim to be above politics, can instead be seen to be central to some very political issues - power and control, for example. Attempts to ignore the social/political aspects to ecological problems are rooted in the people-nature division and in the reductionism and cause-effect model which characterize scientific inquiry under the DWEP. Social Ecology brings to the changing of the paradigms an awareness of the political nature of such process, and the political implications of life in a changed paradigm. Social Ecologists have pointed out that what anthropocentrism is to non-human nature, hierarchy is to human. Some social institutions exist which function only to legitimate domination of some part of Nature by some group of people. A healthier relationship must necessarily be one which empowers all of Nature, human and non- (Bookchin, 1982).

The question of anthropocentrism has been dealt with on several occasion in the course of this dissertation. What has emerged is that, just as replacing the DWEP involves more than simply reversing it, so there is more to the anthropocentrism issue than there may first have appeared. It is impossible, and indeed unwise, to pretend not to be human - such an approach is better suited to the abstract formulations of the DWEP. A degree of anthropocentrism is therefore inevitable; but like many other things, this can be open to interpretation. Under the DWEP, anthropocentrism was interpreted to mean that humans are more important than everything else; this indeed was almost the definition of being human. Under the Green Paradigm, and following Deep Ecology, this definition changes to suggest that one can only truly be human by identifying with, and through, everything else. Anthropocentrism can thus be interpreted both positively and negatively, and may have been thought to be more of a problem than it in fact is. It is one thing to say that because one is human, one is more important than anything else; and another to say that because one is human, one is a part of everything else. Eco-feminism concurs with the ideal, and suggests that the undervalued experience of life which is presently largely restricted to women, the ideals of nurturing, caring, and empathy with Nature which are seen as feminine, can provide a direction and an ideal for the improvement of society as a whole. Eco-feminism extends the positive anthropocentrism argument further, suggesting that appropriate human behaviour would not be exploitative or harmful. Eco-feminism brings a suggestion of compassion to the argument.

Gaia is an example of a scientific approach which is amenable to the insights of the Green Paradigm. It specifically recognizes the imbeddedness, the *thisworldliness*, of existence, and thus approaches issues of interest from a different perspective to `old' science. People are an integral part of Nature; they can not be left out of the equations as `value-free' models of old science tried to do. The value-free claims of old science hide many of its biases; its sexism, its dominance, its arrogance, and its exploitative perception. Such biases are at least part of the reason for the inability of science to incorporate a human element - witness for example the splitting of geography in to human and physical. The Gaia hypothesis, on the other hand, is able to incorporate quite readily the insights of social science, and human relations. A Gaia-based science, while not necessarily the only possible approach for science under the Green Paradigm, would necessarily encourage an attitude of concern for the object of study, since both it and the observer are seen to be parts of the same system; inseparably and eternally interlinked.

CONCLUSION

Science and technology have vital roles to play under the Green Paradigm, but must incorporate into their axiomatic assumptions the changed perspective. They need to be at the service of the whole system, not just one piece of it. The present system where they function almost entirely to allow increasing exploitation of Nature is necessarily unsustainable, and is not based in the reality of an interdependent planetary system of which people are one part. Science and technology need to adopt a *thisworldly* approach, and to abandon their *otherworldly* one. Ideally they should be aimed at empowering, rather than disempowering, communities and individuals.

Nowhere is this more apparent than in the field on energy. Each step up the energy ladder; from wood to coal, coal to oil, oil to fission, fission theoretically to fusion, has meant increasing costs, increasing pollution, increasing danger, and increasing concentration of control in the hands of fewer and fewer individuals. It has also meant increasing vulnerability of individuals, communities, and even cities, to disruptions in the supply of power - one thinks, for example, of the blackouts in New York City. Cities are structured to rely entirely on huge energy inputs. In spite of this technologies exist which could enable households or small communities to generate their own electricity, for example through biomass conversion. The problem, of course, is that it is industry which consumes the majority of energy. Without a change of perspective any energy freed by technology would simply be used by other technology for production.

Not only would the axioms of a Green science be different to those of science under the DWEP, but so would its goals. Although not a necessary feature of the analysis, many of the examples of ideas which contribute towards the Green Paradigm are marked by a search for meaning, a deeper quest than that given to conventional science; the work of Smuts, of many of the quantum physicists, and even of early ecologists, was marked by an awareness that the real issues were metaphysical, and that what was being chased on Earth was simply a shadow. In some ways it was this which led conventional science to its abstract approach, but this was not an appropriate direction. As the DWEP developed, and God was used less and less as a scientific hypothesis, supporters of the hypothesis conflated this argument to imply that there was no meaning in the universe. Instead a Green science continues to ask Plato's questions; why is there a universe, and what makes it? (Lovejoy, 1942). It is a refusal to accept that reality is a meaningless collection of brute facts. This is obviously not the place to start writing a book of rules for Green science, but it would appear that such a science would be more than purely nomothetic.

The Green Paradigm presents a picture of human existence as inexorably imbedded in experience, in Nature. It is a picture which has major implications for the structure and function of society. If people are a part of Nature, then an economic system which perceives value as lying only in those parts of Nature of use to people is clearly in conflict with the new ethic. Economics must accept that eternal growth is not possible on a finite planet. Increasing growth must mean increasing exploitation, either of `natural resources', or of people. Neither form of exploitation is indefinitely sustainable. Quite simply, conventional economics is not indefinitely sustainable. An economic system which accepts the validity of the first and second laws of thermodynamics must emerge, and development must be separated from growth as ontologically distinct categories. In spite of this, however, the spirit of the Green Paradigm remains more in sympathy with the ethos of a system of free exchange[1] than it does with the bureaucracies of any centrally-planned system. Constraints on action should be ethical and voluntary, rather than imposed by a state or a bureaucracy.

The paradigms are as different as their metaphors. The DWEP places people in the centre of an atomic universe, ordered and discrete; mechanical and understandable. Within the framework of the Green Paradigm the universe appears more as a giant thought than a giant machine; infinitely complex, multi-dimensional, and totally interconnected.

Applying the Green Paradigm

Towards a Green economics

Both `environmentalist' and Green concerns and ideas are frequently conflated with ideas on the limits to growth. This is perhaps overly simplistic. Green is not about defining carrying capacities and warning of doom and gloom for transgressions of these; that would be a reductionism inappropriate to Green thinking. It has been suggested that the enthusiasm for an undefined `growth' which marks much of the economic thought within the DWEP is little more than a hangover from a time when an endlessly growing population was seen as a natural blessing, or later, simply as desirable, and before the diminishing returns of such population growth became apparent. A growing population places demands on the economy which are most easily satisfied by a rapidly growing economy, the vagueness of the term notwithstanding. A stable population does not place the same demands on the economy, and thus on the environment, and allows for a condition

1 It should by now be apparent that even the free market at its free-est is not truly free. It remains constrained by the assumptions of the paradigm within which it operates.

of general satisfaction and comfort beyond which additional growth can be seen as perhaps unnecessary, perhaps greedy. There are no simple biophysical limits to growth beyond which awful things will happen, or if there are these are hopefully still quite far off. Instead the limits to growth which matter most immediately are social - the decay of spirit and morality, and ethical - growth implies taking what is something else's by force. There are trade offs to be made, and these will be different under different ethical systems. There are no simple rules and simple answers. Again the question of values occurs. The question of economics is of crucial importance, because it is here that the assumptions and axioms of the DWEP are worked through to their logical conclusions. The emphasis placed on economics is a feature of the assumptions of the DWEP, and it is doubtful whether the field would have the same dominant status under a Green Paradigm. Nevertheless, as the channel through which questions of distribution and equality are most easily addressed, it is important to demonstrate that, while Green Economics is still a long way off, there are ideas on which work can be done.

Equality and distribution are vital issues. It has been argued that inequality is one of the assumptions of the DWEP; that a closeness to nature is seen as justification for exploitation by those with the power to do so; who are, by the same definition, further from nature. The assumptions of the DWEP take it for granted that people are heading in more or less the same direction (the rejection of the uni-directionalism of Rostow notwithstanding; this is merely another anomaly for the DWEP), and that `entrepreneurial man' is at the top of the evolutionary tree. This attitude has become particularly apparent with the collapse of the nominally socialist states. Under this assumption, inequality is regarded as a temporary phenomenon; a condition which will last only until everyone has reached the end of the development (Neo-Darwinian evolutionary?) continuum. Within this framework it is argued that redistribution is unnecessary, because growth will eventually eliminate the inequalities. With a different set of starting conditions in its assumptions, it could be argued that the Green Paradigm would not lead to a condition where the inequalities are as marked as they are today, particularly those between the First and Third World. Nevertheless, these conditions do exist.

Unlike Marxism, the Green Paradigm does not necessarily see a new society arising from the collapse of the old; it is not a progression from the DWEP, it is an alternative. Revolutionary Marxism equates the conditions which it sees as leading to the collapse of capitalism with the conditions for the emergence of a socialist, and later communist, society. Within its framework of analysis they are a logical sequence of events. This is not the case with the Green Paradigm. The competing cultural paradigms are separate strands in the Western cosmology; they are not consecutive, indeed they may be divergent. There is no necessary progression from the DWEP to the Green Paradigm. The Green Paradigm thus does not necessarily possess the ability to deal with problems created by the actualization of the assumptions of the DWEP. Problems created within the DWEP may continue to be problems for the Green Paradigm; all it proposes is a different way of looking at them.

It may be argued that the concentration on the fundamental assumptions of the DWEP which has, for the sake of brevity, been necessary in this dissertation, has meant the elimination of many of the sophistications by which the conventional economic system, along with that of science, deals with its internal contradictions and anomalies. This may well be true - certainly it is not the minutae which is the focus here, and much detail has been covered by the broad brush strokes used. One of the contentions of this dissertation is that it is the axioms, rather than the theories constructed to implement them, which are important. It should therefore be of interest to concentrate on a particular aspect of the economic system, and to see whether a Green perspective has any insights which have been missed by conventional theorists. Existing inequalities are such a problem. Within the Green Paradigm they would be unjustifiable, and indeed they provide a dilemma for supporters of the DWEP. Adoption of a Green framework would clearly have an impact on development theory. The differences between living standards in the First and Third World, and the inequalities and injustices which characterize the development debate are frequently commented on by geographers. Concentration on the axioms of the DWEP have led to it's being portrayed as devoid of concern; an unstoppable juggernaut on a course which will eventually crush everything in its path. In many ways this is the point; it is the theme which counts, not the infinite variations on it which can be played. Certainly there are concerned people attempting to reduce the inequalities, but they remain constrained in their potential actions by the limitations of the paradigm within which they contextualize their work.

Aid

The Aid debate is a classic example. It has been through a number of fads and fashion in its time, yet the concept of aid to `developing' countries remains a popular one in the `developed' world. A number of reasons for this situation have been suggested: firstly, that people of `good will' in `developed' countries share a belief (often assisted by a sense of guilt) that the poor people in the `developing' countries ought to be able to live better lives, that they can assist in the achievement of this goal, and that externally provided capital and human resources will help.

Secondly, that this viewpoint has been heavily promoted by governments and agencies who have highlighted the positive role they claim they can and do play, in spite of the fact that they will readily acknowledge a number of ulterior motives including commercial, security, and political objectives as well as historical ties. Thirdly, that even those sceptical of official and state aid projects, such as churches and voluntary organizations, contribute to the belief that aid alleviates poverty by providing it in some form, often their own. Finally, aid is supported not only because people believe it ought to work, but that it has worked; examples cited may be the Marshall Plan for the reconstruction of Europe, as well as South Korea and Taiwan, which were supported by aid in the 1950s and which continued to grow after it was withdrawn (Riddell, 1992).

Naturally, there are questions raised about the effectiveness of aid. Sub-Saharan Africa provides a popular focus for debates on the subject. While aid to the region has grown considerably over the last thirty years, the gap in living standards between this area and other parts of the `developing' world, let alone the `developed', have increased. Over the last ten years there has been increasing poverty, and many types of aid interventions such as livestock projects and complex integrated rural development projects have been acknowledged by their external promoters to be failures (Riddell, 1992).

On the other hand, it can be argued that, while aid flows to the area have increased, when compared to the increased poverty this inflow has not been great; and indeed is often in response to particular crises rather than the cause of the situation in general. When compared to the net outflow of debt repayments or the brain-drain from Africa, the impact of aid has been marginal at best. From this point of view it could be argued that if aid has failed it is because there has not been enough of it (Riddell, 1992).

Not only that, but aid packages have become increasingly open about the ideological strings attached. Not only are the recipient countries expected to behave in certain manners in order to receive aid, but politicians in donor countries present ideological positions as accepted facts. For example, where it has been acknowledged in development literature that there is no best path to development, and nor is there a close correspondence between the strategy for development and the resultant political system (Griffin, 1989); US Secretary of State for African Affairs Herman Cohen has asserted that greater political democracy *leads* to greater economic development (Riddell, 1992). A widely held, but contradictory view, is that:

> "The democratization of aid was an illusion, of which the real victims were the intended beneficiaries; the disadvantaged peoples of the developing world. Their representatives, encouraged to believe that aid would contribute crucially to development progress, had placed it high on the world agenda. But aid flows would be subject mainly to the wills of the largest donors whose responses - except in the case of short-term relief campaigns - were tied more to immediate domestic economic exigencies than to broader development needs" (Brown, 1990, p. 234).

The 1960s were an optimistic period for aid, and high growth rates were achieved in a number of target countries, even in Sub-Saharan Africa. Yet before long people noticed that the benefits were not `trickling down' and that poverty was not being alleviated. In the 1970s development became conceptually de-linked from economic growth, and targeted aid projects were formulated along the lines of strategies like `basic needs' or `redistribution with growth'. By the late 1970s it became apparent that these projects had often missed the intended mark, and that macro-economic problems were threatening to overwhelm the economies of the `developing' nations. Structural (and short term) adjustment intended to address these macro-economic problems became policy. Exchange rates were changed, removal of price control and subsidies mooted, trade liberalized, and the private sector promoted. Official aid was increasingly conditional and no longer focussed on poverty (Riddell, 1992). Through the 1980s evidence accumulated that once again the poor were suffering the most, and that countries which had not adopted structural adjustment policies (SAPs) were not doing any worse than those which had, reducing the dominance of the SAP approach (Evans *et al,* 1991).

SAPs remain popular, and they signify a confidence in the central role of the market in development, but there are now three new trends. The first is a return to some form of basic needs approach of directly targeted intervention. The second is the increasingly important role being given to Non-Governmental Organisations, on the assumption that they, at least, should have some idea of what best to do, particularly as regards direct poverty alleviation. The third trend is the importance being placed on non-economic factors which are believed to provide the structure of internal efficiency, in particular concepts like `governance' and `capacity building', intended to enhance or create a capacity within local structures to run their economies effectively (Riddell, 1992).

A major critique of many of the programmes is that they failed to include, or even acknowledge, `environmental' issues, gender concerns, and the fate of indigenous populations (e.g. Waller, 1992; Heyzer, 1992). It is these issues which will be among the targets of the new aid programmes and projects, whether it be through the old `victim' mentality of the welfare approach, through the integration of women in development, through gender sensitive planning and implementation, or through empowerment (Heyzer, 1992). Yet just as in the past it proved impossible to evaluate the contribution of aid to economic growth (Mosley, 1987; Riddell, 1987), so too it will be incredibly difficult to evaluate its contribution to non-economic sectors (Riddell, 1992).

Central to the problem is a failure to reach consensus either on what development is, or on how to reach it - is there an ultimate goal, and if so what is it? Where in the 1960s and 1970s people noticed that increased growth did not necessarily reach the poor and eliminate poverty, and were forced to separate growth and development, this has largely been forgotten now that the increase in growth is a no longer there. Aid theories in the 1990s are certainly more complex than they have been at any time in the past, but the retention of SAPs and the importance placed on institution building suggests that to a large degree the market place is still regarded as central to development. The recognition that targeted aid has a place - albeit a small one - is an acknowledgment that the market alone is insufficient, and that there may be a conflict between growth enhancing and poverty reducing strategies (Riddell, 1992). Yet direction is lacking; the goal remains unclear, as does the path to achieving it, to say nothing of even measuring progress towards it. Riddell (1992) concludes:

> "The worry is that in the absence of unambiguous evidence to indicate either the relative impact of different sorts of aid, or the overall impact of all aid to different recipient countries, the temptation will spread for donors to base their aid strategies more on ideological assumptions of what they think ought to work than in the reality of what does not" (p. 14).

In other words, in spite of all the evidence to the contrary, economic systems framed within the DWEP tend to fall back on the equation of development with growth when they have proved to themselves growth does not even reduce poverty, let alone create development, whatever that is. They do this for a simple reason; there is no acceptable alternative. The equation of development with progress with the emergence of entrepreneurial man[2] is central to the DWEP. To equate development with anything else might mean the peculiar situation where the First World found it was not actually a developed world at all, and that it was not necessarily even heading in the right direction. The challenge this would present is apparently too fundamental to be countenanced.

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2 Deliberate.

THE GREEN PARADIGM

It is not enough to simply equate developed and developing countries with geographical areas. There is a more than sneaking suspicion that the processes which cause underdevelopment in the Third World are similar to, and indeed linked to, those which cause alienation and inner city underdevelopment in the First World. Yet aid theory is remarkably simplistic; aid is generally intended to reduce poverty, not inequality - they are equated under the DWEP. Symptoms of inequalities such as poverty, sexism, elitism, and racism are singled out for special treatment; targeted programmes. Yet there is a remarkable similarity between this approach and what Schnaiberg (1980) called his "planned scarcity synthesis", a point examined in some detail in chapter one. The inequality itself is reduced to specific examples, leaving the root of the issue untouched, unexamined, and unchallenged.

The Green Paradigm challenges many of the fundamental assumptions of conventional economics. Like the DWEP, it does not contain explicit directions for dealing with questions of justice and inequality. Yet it is argued that the picture created by adoption of the Green Paradigm; that of the world as a vast and complex cooperative enterprise between humans and the rest of the planet aimed at keeping the Earth habitable, provides a very different model for human development and of appropriate human behaviour to that of the DWEP, particularly since the collapse of alternative `socialist' systems. Indeed this collapse has imbued the assumptions of the DWEP with a sense of correctness and appropriateness which automatically denigrates criticism, and which is extremely dangerous.

Where it is commonly held that growth and redistribution are mutually exclusive, in that growth raises the living standards of all members of society, rendering redistribution unnecessary; this is demonstrably not the case. As was mentioned above, it has been noted in the past that growth does not alleviate poverty; it simply does not necessarily trickle down even where growth occurs. In aid packages this has meant the introduction of specific policies which are obviously redistributive, and which are targeted at problems like poverty. Redistribution, in this instance, means taking from those who have, and giving to those who have not. It is a deliberate, explicit act. Yet it is made necessary because of the existence of another form of redistribution; the taking from those who have little, and the giving to those who have much. This, it is argued, is one of the fundamental principles of capitalism (Lee, 1989). The Enclosure Laws of Britain, particularly those in the eighteenth century, removed access to commonage from the hands of the poor, and concentrated it in the hands of the wealthy in order to facilitate a profitable wool industry. Slavery, dispossession, proletarianization, underdevelopment, and impoverishment of colonized and subordinate countries fueled the economic growth of the First World in its early years. The principle remains effective today in the new international division of labour, and of the mining of the resources of the Third World. The net outflow of money from the Third World to the First, and the enormous Third World debt is evidence of this. It has been argued that even if the whole Third World debt were wiped out entirely; in order for the sub-Saharan countries to return to the economic position they held during the 1965-1980 period within the next decade, they would need growth rates of 8.8%, rising to 10.5% for the severely indebted countries; a clearly impossible task (Singer, 1992). But, of course, the debt is not being wiped out; it is more likely to be swopped for resources. Strangely enough the huge debts of First World countries do not seem to be regarded as quite as much of a problem as those of the Third.

The lack of ownership of the objects of production could also be said to be an example of this malignant form of redistribution; the `trickle down' or even the failure thereof. The poor simply get poorer. When it is noted that women in most industrialized countries still receive only 60-70% of men's wages overall, the same percentage as 100 years ago (Simmons, 1992), and that the gap between rich and poor is growing, even in `developed' countries, malignant redistribution must be accepted as existing. Indeed it has been reported that in the USA in 1981, women earned 56-59% of the comparable male wage (Dworkin, 1983), and that 78% of those living in poverty in the USA are women and children (Seager & Olson, 1986). The point is simply that questions of redistribution often fail to appreciate how much redistribution is happening already, and tend to focus on more dramatic issues like white farmers loosing their farms to black governments in Zimbabwe. This is important in establishing the distributive principle implied by the Green Paradigm, since it is argued that the principle implied by the DWEP is one of inequality both as a fundamental requirement for economic growth, and as an axiomatic assumption.

A social or moral theory functions around its chosen substantive values; the central good(s) to be aimed at in life (Lee, 1989). Within the DWEP this has been accepted to be the ever increasing possession and consumption of material goods. Yet this is not enough; the society also needs to know how the good is to be distributed; in order to be coherent, a social or moral theory requires a distributive principle to accord with its substantive one. This can be a principle of equality, or of inequality (Lee, 1989). It has been argued that the DWEP accepts, tacitly if not openly, a principle of inequality. This it justifies by recourse to the argument that there is enough of what is considered wealth for everyone, and that everyone has the potential if not the ability to be wealthy in monetary terms. In the long run we can all be rich. There are a number of flaws in this argument. Firstly, while money may be limitless, the planet is not, and there is a limit to how much can be converted in to money before the essential systems break down. Secondly, economic growth does not alleviate poverty, let alone lead to `development', even in the First World. Thirdly, the argument implies that it is possible for the poor to catch up with the rich, without the world collapsing. Considering the wealth of the First World (as well as the present system of capitalism) was built on the exploitation of feudalism and colonialism, both malignant forms of redistribution themselves, this is rather like suggesting that a five kilometer race between two runners, where one has to carry the other for the first four kilometers, gives each a fair chance of winning. The logic of exponential interest rates further suggests that since the First World economies are several times the size of Third World ones (and always have been), Third World economies would have to grow several times faster than First World ones just to catch up. Since they supply raw materials and labour to the First World, however, this is not in the interests of the larger economies, even if it were possible. The same logic holds on a smaller scale within individual countries between the rich and the poor. Fourthly, of course, the finish line keeps moving under the relentless pressure of capital expansion. If the First World were to stop, and some of its energy were to be diverted to the Third, there is a small chance the Third might reach them; eventually. As it is, they might as well be running in different directions.

Some of these are inequalities which result from social and economic systems. Some of them are the inevitable result of the axioms of the DWEP. In combination they make equality between people an impossibility under the present circumstances. Even on an individual level, while one hears the occasional story of a penniless waif who became a billionaire, this is not a course open to all. A society composed entirely of billionaires would not function; the financial success of some requires the financial failure of others. Economic growth cannot substitute for benign redistribution (from rich to poor) because it is built on malignant redistribution (Lee, 1989).

Given that a) that economic and social inequality leads to social disruptions like wars; b) social disruptions have severe economic, social, and ecological impacts and generally interfere with the leading of a fulfilled life; c) that one of the primary roles of a social system should be to allow people to fulfil themselves; and finally d) that people are dependent on the natural resource base of the planet, and an ability to increase production temporarily or to destroy the entire system does not alter this; then it follows logically that equality should be maximized in a balanced social system rather than minimized.

But if economic growth cannot do this, because a) economic growth is a zero-sum game (being played on a finite resource base); b) the thesis of diminishing marginal utility suggests that increased consumption does not lead to a commensurate increase in satisfaction and is therefore inefficient - as a human agent there is only so much we can use at one time, we can only be in one house at a time, eat so much, drink so much, etc; c) that consumption by some does not mean the satisfaction of needs of others unable to consume, and in fact prevents their being able to satisfy needs (Lee, 1989), to say nothing of the other constraints imposed by other axioms of the DWEP, would contextualizing the problem within the Green Paradigm help?

The Green picture of the world as a vast, interdependent cooperative enterprise is not immediately useful to the aid/development crisis. Yet it contains insights which are. Firstly, it suggests that humans are dependent on the system, not the reverse, and it is in their interests, as well as those of most of the rest of the planet[3], not to disrupt the system. Secondly it suggests that excessive competition may be detrimental to the system, on any scale. Thirdly, it suggests that it is reasonable to maximize rather than minimize equality in order not to damage the eco-system. Fourthly it suggests that wealth is not simply money, and that accumulating money at the expense of other aspects of well-being is illogical; it rejects Locke's ontological substitution of money for low entropy energy and matter (Lee, 1989). Fifthly, it places the entire development debate within a larger framework, suggesting not only that endless accumulation is impossible, but that it is not development itself, nor need it lead to development. Instead development comes to mean the fulfillment of genuine human needs, including self-actualization, which implies the freeing of human potential; it is fewer laws, not more, which mark a developed society. Lastly, it suggests that one of the goals of a society is to provide the conditions necessary for the development of its members, which places before science and even economics, the goal of attempting to understand as much as possible about the planetary system in order to avoid damage to it.

The challenge, of course, is to produce an economic system which does not contradict the axioms of the Green Paradigm. Thus an economic system framed under the Green Paradigm would have the following goal; to maximize development (which includes and necessitates equality) through efficient distribution of low entropic energy and matter in a manner which does not unduly stress the ecological balance of the planet. In this context development and growth are finally and completely separated. Development is the fulfillment of genuine human needs and

3 Apart, perhaps, from anaerobic bacteria.

the freeing of human potential and has nothing to do with growth. One way of doing it is to acknowledge that many human needs are internal ones, but that the satisfaction of external (biological) ones is required before the internal ones can be met. Internal needs include the need for security, love, and acceptance. Only once these have been satisfied can the highest level, that of self-actualization, emerge (Maslow, 1954). Some psychologists have written about the `need' for mastery or control; seeing this as a kind of self-actualization (e.g. White, 1959, Lefcourt, 1973). For example: "Man's primary motivational propensity is to be effective in producing changes in his environment" (deCharms, 1968, p. 269). In other words, while within the DWEP the need to self-actualize is noted; it is merely distorted by the frame of reference of the cultural paradigm and is equated with a mastery or control of nature, a position with obvious psycho-sexual and Neo-Darwinist roots.

This is a dangerous and unnecessary conflation. If there is, as there appears to be, a broad level of agreement that many fundamental human needs are internal, this offers great potential for a more benign economic system, given that the fulfillment of internal needs, unlike external needs, need not place stress on the planet. A necessary condition for the maximization of self-actualization as self-development in individuals is the provision of an environment which encourages such development by elevating it to the central dominant value of the society, and by ensuring resources for such development are provided to all individuals in a way which is not harmful to Nature (Lee, 1989).

One alternative (certainly not the only one) returns to an early socialist formulation with which Marx toyed for a while before rejecting as utopian; the idea of ascetic socialism. This was inspired by thinkers wrestling with the problem of why work had become a curse under capitalism, and led them to conceptualize a social arrangement where the dichotomy between work and leisure is transformed, if not transcended. The alienating effect of industrialization on workers needs no repetition here; it is well noted even within the factories of capital. Charles Fourier, as one of the more notable thinkers in ascetic socialism, suggested two pillars on which a more balanced society could be built; liberation from sexual oppression, and liberation from the work ethic we now call Protestant. Instead he argued that work need not be alienating, it could be spontaneous, done willingly and joyfully in pleasant surroundings. These are values celebrated both by economists of the Schumacher school and by the back-to-the-land communalists of O'Riordan's. Yet Fourier was not unrealistic; he argued that commerce had a legitimate place, and that buying and selling is an innocent act, provided that a) the goods are well made, and b) the prices are honest. He was also aware, however, that:

> "Progress in the science of chemistry, to cite just one example, only serves to plague the poor by providing commerce with the means to debase all commodities; bread made out of potatoes, wine squeezed from logwood, sham vinegar, sham oil, sham coffee, sham sugar, sham indigo. All our foodstuffs and manufactured goods are adulterated, and it is the poor man who suffers by this chemical cheapening; he alone is the victim of all these mercantile inventions. They could be put to good use under a system of truthful relations, but they will become increasingly harmful until the close of civilization" (Fourier, cited in Lee, 1989, p. 245).

In essence what Fourier was suggesting was that the central values of society should be ecologically and socially sensitive. Lee (1989) argues that Fourier advocated the artistic mode of production, which is an attitude toward whatever is being done; be it growing pears, keeping books, or playing the flute. He insists that part of the reason for the ridicule of this system is that it is often presented as idyllic, rather than as hard work. The artistic mode of production can be characterized thus:

1) an activity is not subordinated to external ends like reward, fame, and honour;

2) the artist (a term which is not confined to what we conventionally consider art, but which represents the dissolution of the work-leisure distinction) attempts to work according to the rules inherent in the particular art, not according to outside rules which may warp or prostitute the art;

3) it is the artist's activity which is the end, not a finished product - as such the artist and material are part of a single process;

4) because the activity is part of the artist rather than being constrained by outside goals, the artist need not regard others as competitors;

5) an activity which allows an artist to transcend themselves and to dedicate the self to a larger ideal or movement will reduce conflict between the individual and the demands of society (Lee, 1989).

The benefit of such a system is that it maximizes co-operation at the same time as minimizing ecological and social stress. It looks idealistic and unworkable at first, but it bears thought. Certainly the move away from money as the sole measure of wealth is necessary, both in terms of ecological stress and social well-being, but will involve huge economic rearrangement. However the African countries are already moving in this direction, simply because there is no way that they will be able to repay their foreign debt. As a result, external money is becoming less and less of a real thing[4]; the situation has simply reached the point where people no longer believe in money because the figures are too fantastic and too out of touch with the real world - the sub-Saharan African debt rose from US$ 48.3 billion in 1978 to US$ 230.6 billion in 1988 (Adedeji, 1990). There are concerns by conventional economists that there is an involuntary de-linking of Africa from the rest of the world economy (Harcourt, 1992), matched by calls from more radical African economists to in effect begin a deliberate de-linking process (IFAA, 1987). Yet without a clear alternative economic model (not that there is at present a clear economic model being used in Africa or anywhere else), such a de-linking process would mot necessarily solve anything and may just be re-inventing the wheel.

Within the framework of the DWEP, it is effectively impossible to separate development from economic growth, not because everyone believes them to be the same thing, clearly evidence suggests otherwise, but because the axioms of the DWEP assume them to be. The closed steel mills of Youngstown, Ohio, and the closed motor car factories of Michigan, with their resultantly stagnant towns and unemployed workforce suggest that even in the heartland of capitalism, true development is elusive. Equally, local elites and power cliques in the Third World play a significant role in increasing the inequalities in their countries, at the same time creating local role models of accumulation. The *Wabenzi*, which literally means `people of the Mercedes Benz' is an African term used to describe members of the elite, the politicians, the businessmen, the criminal element. While there are certainly customs and traditions in the Third World which disempower certain groups, the adoption of the goals formulated in the DWEP has frequently reinforced these and added new sets. Inequalities are almost inevitably reduced to financial measures; poverty means lack of money where it could mean a poverty of spirit. Self-actualization through the collection of possessions and power leads to the logical conclusion that a Florida drug dealer, with ten bodyguards, five houses, three yachts and twenty cars is a better person than a volunteer nurse in central Africa who has never driven (and will never drive) a car. The understanding of what it is to be human which emerges through the Green Paradigm gives a different set of goals and a different set of measures to a society. Poverty can not simply be addressed with money, and in some instances it may not even take money to address it. Satisfying genuine human needs is not a zero-sum game; teaching someone to play the piano does not deprive the teacher of their own skills, and places little stress on Nature (Lee, 1989). Of course teaching someone to play the piano is not going to feed them, but in many instance the reason for someone's starvation is that the resources they need to meet their basic food requirements have been siphoned

4 Not necessarily on an individual level, of course.

off to meet the accumulation `needs' of the First World. As long as people have access to viable land, and are not required to produce a surplus to pay money to someone, or to service their nation's foreign debt, they have a good chance of feeding themselves. If Africa were not so busy growing strawberries and other cash crops it would in all likelihood be quite capable of feeding its population. Genuine development is as needed in the richest parts of the First World as in the poorest parts of the Third. Probably more so, indeed it is the richest parts of the First World which may be expected to offer the greatest resistance to the concept. Examining development through the Green Paradigm necessarily strips it of its Euro-centric arrogance, and of its money mania. Of course many of these ideas have been aired before, but the important point is that they have not been able to take seed because they have not seen or sought to challenge the entire paradigmatic framework of the DWEP, and have as a result been colonized or ignored, or simply `don't work'. Instead of being addenda or little `planned scarcity syntheses' they are presented here as integral parts of an alternative structure.

The intention here is not to produce a definitive Green economic theory, rather it is to argue that there are considerations which are more readily and more logically addressed within a Green framework than that of the DWEP. Green ideas, it appears, do provide a fresh angle on a somewhat stale debate.

Towards a Green science

There is no reason to suppose that a society operating in accord with the axioms of the Green Paradigm would find it necessary to retain categories like `science' and `economics', and one might reasonably expect the boundaries of these fields to at the very least be more permeable than they are today. Nevertheless, the jobs performed in these categories would remain necessary, and it is more convenient to discuss them as though the categorization were retained. Certainly there would be more overlap between these two categories than there is at present; scientists could no longer justify producing expensive petrochemical compounds for sale to poor Third World farmers on the grounds that what was done with the product was none of their business.

Science is a means by which knowledge of the universe is collected and processed. Yet science is also a social product; society dictates what will be studied, for what purpose, and by whom. Reciprocally, science creates society by providing it with information about the universe; information which people use to structure their relations in a manner appropriate to the information. In the past science, under the direction of society, collected evidence which `proved' human mastery over

Nature. In the process, however, it also collected a great deal of information which suggested that people were not lords of all they surveyed. The axiomatic assumptions which characterize the DWEP have not allowed science and society to adapt accordingly, and have effectively suppressed this information. Instead science has been increasingly directed towards accumulating and processing information purely for the purpose of extending human control, and in its most extreme form has been commodified within capitalism, its research agenda almost entirely controlled by the dictates of business. Reductionism, a misplaced belief in science as being value-free, and a concentration on linear cause-effect methodology within science has assisted in the subjection of science to economic whims; scientists, by and large, have failed to see the larger social picture within which they operate. It has even been argued that many individuals choose science as a career because they personally are asocial, and are attracted by the asocial mystique of the field, simultaneously reproducing this feature, a point expanded on in the second chapter.

Within the Green Paradigm science remains a search for knowledge and a means of processing it. Yet both the goal and the method shift slightly. There is sufficient evidence that human mastery is a myth: "Will the wild ox be willing to serve you?... Does the hawk soar by your wisdom?" (Job, 39). Science has produced overwhelming amounts of information which suggest that human actions have a noticeable impact on the planet, and that many are harmful. There is no evidence of mastery; control over some portions, certainly, but always with a cost somewhere else in the system. Logically this suggests that one cannot structure something as powerful, and with such huge impact, as the whole of Western society, on what it patently untrue without running a serious risk of damaging the planetary system. Yet the subordinate position of science to economic rationality in the DWEP ensures that the present direction will be maintained. A spokesman for Shell, talking about the greenhouse effect, put this in a nutshell: "We are not going to put the whole world economy into reverse on account of a theory"[5]. Society expects certain things from science, which in itself constrains the way science is free to operate. Society wants proof of things, which limits science to linear causation models when the evidence suggests that the majority of natural relationships are non-linear. There need not be a linear relationship between the amount of carbon dioxide put into the air, and global warming; in fact it is extremely unlikely to be a linear relationship, there is more likely to be a critical threshold. What this amounts to is to answer "we don't know" when society asks how much carbon dioxide it can pump out. This is an unacceptable answer for most

5 At a presentation to the Environmental & Geographical Science Department (UCT), 1991.

people. The result is that they return to the assumption of a linear relationship, and then use the evidence that there is no directly proportional relationship between CO_2 and global warming to argue that there is no connection at all, or that the tolerance limits have not yet been stressed and that there is therefore no reason to stop polluting. As a plaything of capital, even science can be used to argue that the lack of a linear relationship implies no relationship. A science which has lost the ability to provide direction is a sorely degraded science; worse than useless, it is very dangerous.

In many ways the fate of science parallels that of bourgeois democracy. Both were born as exuberant forces for liberation from feudalism and of mysticism, yet both have become caricatures of their former selves. Where science was bold and antiauthoritarian, it is now meekly acquiescent. The free flow of ideas has become a monopoly vested in those who control the resources for research and publication. Free access to scientific information has been reduced by military and commercial secrecy and by the unintelligibility of technical jargon. For commodified science peer review has been replaced by client satisfaction as the test of quality. Internal checks for maintaining objectivity may, if not corrupted by tensions of jealousy, deference towards those with prestige, cliquishness, and patriotic provincialism, be able to nullify individual errors and biases, but share and reinforce the biases of the scientific community. The demand for objectivity, which ought to mean the separation of observation and reporting from the observer's wishes, instead becomes a demand for the separation of thinking from feeling. This creates the moral detachment in scientists which, in combination with the specialization, reductionism, and bureaucratization which mark the field, allows them to work on all kinds of dangerous, harmful, and morally wrong projects with an indifference to the consequences. In place of the ideal egalitarian community of scholars there has emerged a rigid hierarchy which seems to be modeled on corporations. And where truth is still pursued, it has become increasingly narrow, revealing the growing contradiction between the sophistication of the experiment in the laboratory and the irrationality of the scientific enterprise as a whole (Levins and Lewontin, 1985).

All the assumptions of the DWEP can be challenged, scientifically or philosophically. They are simply not correct or appropriate. Yet there has been no revolution, no paradigm shift. If anything, Western society seems more self assured now that the `communist threat' has gone. The knowledge accumulated by the leading edges of science has not been assimilated by society. From a subordinate position science can no longer make an impact on society. Science itself is being increasingly commodified. The axioms of the DWEP make this process inevitable, the reductionism which characterizes the DWEP allows for the destruction or the colonization of threatening ideas. It appears that only a position which offers an entire alternative to the existing cultural paradigm, and which can accommodate all the anomalies of the DWEP in a satisfactory manner has the potential to effect change.

Like conventional science, a Green science is also a quest for knowledge, but more than that it is also a quest for understanding. There are two differences between this and science under the DWEP. Firstly, the axioms of the Green Paradigm have the effect of broadening the scope of scientific enquiry rather than narrowing them; reductionism may be appropriate in some circumstances, but should not be applied in all, for example. Non-linear relationships are just as `scientific' as linear ones. Scientists are people; this means they impose their own values on what they see. So rather than pretending this does not happen, let them attempt to take this in to account. Society affects science; this must also be accepted and catered for, not ignored. People are a part of a very complex system, we need to know as much as we can about it. Secondly, the uses to which scientific knowledge is put are different. Science must be used for genuine human development, not just for making money on the assumption that this will lead to development. This implies reducing stresses on Nature, attempting to understand the appropriate relationships with Nature. The awareness that people are a part of Nature suggests that self preservation would become Self-preservation, to use the Deep Ecology distinction. Under the Green Paradigm science returns to its rightful place at the service of Nature.

This is by no means to say that the failings of science have gone unnoticed in the past; certainly they have been the focus of a great deal of concern and of debate. Yet again, little has really changed in the way things are done. Since the section on economics above concentrated by way of example on the situation in the Third World, it will be useful to do the same with applied science[6]. The parallels should become readily apparent.

Science in the Third World cannot be separated from history, and the developments cannot be separated from the process by which the DWEP was created and assumed its position as the `right' way of relating to Nature. Nowhere is this more apparent than in the conquest of the colonies. In this there is the conflation of three central themes of the DWEP. In the first stage there is the expansion and conquest which resulted from the technological and social changes of some peoples. In the second stage the technological superiority and greater military

6 This section draws heavily on the work of Levins and Lewontin in their analysis of the impact of First World biology on the Third.

capacity was made synonymous with rationality, and in the last stage this rationality was presented, not as the cause of the conquest and domination, but as its justification. The historical fact of European expansion and conquest was transformed into a `natural' phenomenon, as the logical and necessary consequence of the expansion of Reason. *A* rationality became *Rationality*; a way of knowing became Science, a procedure for organizing knowledge and for finding out became The Scientific Method. The whole complex business of taking over the world in just a few centuries was more than enough argument to demonstrate that the imposition of European reason was a universal and necessary development (Gutierrez, 1974).

Science has moved into the Third World in three different ways, each a reflection of attempts at resolving the internal contradiction between science as a vehicle of domination and science as knowledge. The fourth formulation, dialectical materialism, is presented as a possible route for a Green science. The most common approach is also the least critical. It simply accepts both `science', and its other agendas as legitimate `progress'. Given the situation of Third World poverty, proponents of this approach, which has been called "syncophantic pragmatism" (Levins and Lewontin, 1985, p. 227), argue that a fully developed national science would be a luxury, and therefore limit research to strictly defined secondary modifications of the results of First World science. The result is the reinforcement of economic and intellectual dependence, the introduction of economic policies which are more in the interests of international capital than the local people, intellectual dependence, and frequently to a brain drain of scientists who want to do any sort of fundamental research at world level (Levins and Lewontin, 1985).

The next two approaches are developmentalist in that they subscribe more or less to the idea of progress *a la* Rostow, that it proceeds along a continuum, and that they regard the role of science as being to help people catch up with those ahead of them. While they recognize that a foreign controlled science may work against local interests they remain uncritical of the structure and the axioms of science. The branches of developmentalist science share the common belief that science is progress, but they differ about whom the belief is for, marking them as conservative or as radicals.

The argument that the conservative branch of developmentalism is strongest in countries where the power is held by the national bourgeoisie (Levins and Lewontin, 1985) certainly holds true in South Africa. The leadership can be regarded as the allies, if not the tools, of capital expansionism; a national entrepreneurialism running side by side with the oppression of workers and peasants. The teargas shrouded campuses noted earlier can be seen to be a manifestation of the inherent contradiction in the position of universities. Maintaining a competitive position in the world requires encouraging scientific creativity, but if students are encouraged to think, they often think about things you don't want them to. Teargas is an obvious and a rather crass way of dealing with the problem. Specialization, compartmentalization, an emphasis on technical rather than social skills are all more sophisticated possibilities. There are South African universities where `politics' is banned. Yet this leads to the creation of an outlook on life where Nature is also compartmentalized. Problems may be recognized, but the links between them are not made. Thus soil erosion is seen as a problem. Maximizing the maize yield is seen as a problem. Droughts are seen as problems. Redistribution of land in a post-apartheid era is a problem, and its reverse, the concentration of huge farms in white hands, is also a problem. Yet each is treated with its own specialized solution; the totality and the interconnectedness is not noted. The technocrat is adamant in refusing to pursue the problem beyond the narrow boundaries of his or her field, and equally adamant in ignoring information from outside fields.

Radical developmentalists have different political goals. They note and object to the commodification of science; its use for war and for profit, and its monopolization of knowledge. They seek a national, and a fully developed, science with an agenda which is determined `by the people', and serves to meet the `needs of the people'. Indeed politically the radicals are frequently at least nominally socialist, as in the case of the `alternative' movement in South Africa. Yet where in capitalist countries they play an important (if shrinking) role of pricking the public conscience and militating against exploitation of labour, and against things like profit-oriented health services, their position in societies where they are the dominant social force is more ambiguous and more harmful.

> "The ideology of `modernization', of unidirectional progress has a powerful hold on their thinking. This often combines with a deeply felt sense of urgency to meet the needs of the people and results in a narrow pragmatism, the promotion of specialization, and the enthusiastic adoption of already proven `successful' methods of production and of research. They are impressed by the flashiness of `advanced' science (the more molecular and expensive, the more impressed they are). This approach allows them to plant monocultures of timber to get wood for housing as fast as possible, but it underestimates the dangers of pest outbreaks. They will clear forests to plant food for the people and dismiss the warnings of erosion. They will import toxic pesticides and hope to prevent poisonings by improving protection of farm labourers, but they will remain unconvinced of suggested ecological impacts" (Levins and Lewontin, 1985, p. 229-230).

Conclusion

If there is a single major difference between the short-sightedness of the radicals and of the conservatives, it is that the radicals have no real interest in hiding the harm done by `modern' technologies, and once they become truly aware of these may exhibit genuine concern (Levins and Lewontin, 1985). Yet the fundamental contradiction between science as knowledge for control and science as knowledge for accommodation remains unresolved and largely unrecognized within the radical framework. Levins and Lewontin (1985) conflate this contradiction with that between science as growth of human knowledge, and science as a class product. Certainly there are similarities, but the different frames of reference provided by the two cultural paradigms under discussion here seem more appropriate explanations. The implications of axiomatic assumptions about human mastery are not brought out in the latter formulation.

This point is almost grasped in the dialectical critique of science, one which attempts to recognize both aspects of the contradictory science and lead towards a new interpretation. This approach offers significant potential for a Green formulation of science. The awareness that science is a social product, and has a history interwoven with that of capital imperialism suggests that science cannot be regarded as a homogenic universal. The science in the First World is one of privilege and an abundance of physical resources, yet it is crippled by its subordination to the interests of commerce, ideology, militarism, and even to its own internal organization. Third World science is one sided and incomplete, with an excessive deference to outside experts, an under production of scientists in relations to the needs of the countries, yet an overproduction in relation to the ability of the country to support scientists.(Levins and Lewontin, 1985).

A dialectical materialist approach to science attempts to recognize both these superstructural deficiencies in science, as well as deficiencies in its internal operations which may be causes, or effects, or both, of the social manifestations of science. In ecology, for example, the dialectical materialist approach, in an attempt to get around the fault common to both reductionists and idealist approaches; namely that they see true causes as arising at only one level, the `community' as the causal reality, or in the case of reductionism, the individual species (or cells or molecules, depending how far reductionism is taken) as causal reality, assigns a number of properties to a community. That it is a whole, in a reciprocal relation with lower and higher level wholes, but is not entirely determined by them (cf Smuts' Holism). That some properties at a community level are definable for that level, and are valid objects of study in their own right, however they were caused. That the properties of communities and the properties of the constituent populations are linked both by one-to-many, and many-to-one relations, which recognizes that at various times in the history of science advances have been made either by abstracting away differences to reveal similarities, or by emphasizing the variation within an apparent uniformity. Fourthly, that law and constraint are interchangeable. Fifthly, that in a community species interact, either directly, as predator-prey, through symbiosis, or indirectly through alteration of a common environment. Finally, the way in which a change in some physical parameter or genetic characteristic of a population affects other populations in the community depends both on the individual properties of each species, and on the way the community is structured (Levins and Lewontin, 1985).

What this leads towards is a recognition both of the variety in nature, and the variety in scientific explanation, and most importantly of the interconnection and the validity of both. Abstraction is a useful feature of science, provided it is explicitly recognized. The danger emerges when the process of abstraction is forgotten, and the abstract descriptions are taken for descriptions of the actual objects (Levins and Lewontin, 1985). Abstraction is not in itself an idealist act, but becomes idealistic when people begin to assume that ideals are unchanging and unchangeable essences which have real interrelations in the real world. Abstractions are distinguished from ideals in that they are epistemological consequences of the attempts to order and predict real phenomena, while ideals are seen as ontologically prior to their manifestation in objects (Levins and Lewontin, 1985). Thus the sociobiological assumption that society can be explained by genetic mutations is in itself an idealism. The random mutations and the process of natural selection are taken as given.

Idealism penetrates all areas of scientific study. As has been noted several times, many natural systems function non-linearly, and may be particularly sensitive to various initial conditions. Even statistics, however, which takes as its object of study the real differences between objects; real variation, fails to liberate itself from its assumptions. Instead of studying the variations, statistics consists largely of techniques for reducing, discounting, or separating `noise' in order to see the `real' effects. The theory of hypothesis testing, as well as most of the theory of estimation, have as their primarily goal the detection of true differences between objects in spite of the variations between individuals (Levins and Lewontin, 1985). Yet this variation between individuals may be the initial condition which changes the entire iteration of a process.

In the end, the assumptions of Western science have proved inadequate for the study of complexity. Firstly, the reductionist myth of simplicity has led its advocates to isolate parts as completely as possible in order to study the parts. This has led to the undervaluation of the importance of interactions, both in theory and in practice (Third World agriculture and programmes like the green revolution are classic examples). Recommendations are thwarted, not because of error in the study which was done, but because of indirect or unanticipated consequences which were not considered. Secondly, reductionism ignores the properties of complex wholes and sees the effects of these as being noise. As a result data reduction and statistical prediction, which are based on removing `noise' are passed off as explanation. Thirdly, the faith in the atomistic nature of the world makes it more difficult to study the nature of interconnectedness. If simple behaviours emerge out of complex interactions, reductionism takes the simplicity to deny complexity; if behaviour is complex this is used to deny regularity (Levins and Lewontin, 1985).

> "Both the internal theoretical needs of ecology and the social demands that it inform our planned interactions with nature require making the understanding of complexity the central problem. Ecology must cope with the interdependence and relative autonomy, with similarity and difference, with the general and the particular, with chance and necessity, with equilibrium and change, with continuity and discontinuity, with contradictory processes. It must become increasingly self-conscious of its own philosophy" (Levins and Lewontin, 1985, p. 160).

Geography must do all this and more. This dissertation has argued that an awareness of the philosophies is not enough, an active change is needed. The Green Paradigm and the DWEP are two views of Nature which co-exist uneasily in the Western world-view, and they have had impacts, both individually and in their interaction, over the whole of Western society. Where Levins and Lewontin use their Marxist leanings and dialectical materialism to tremendous effect in pushing the boundaries of ecological thinking, their work predates the `collapse of socialism'. The limitations of Marxism as an appropriate economic working model have become readily apparent and were expanded on in the third chapter. In many ways the use of dialectical materialism by Levins and Lewontin has moved far beyond the orthodox position, and provides a very useful model, and analysis, on which to develop a future geography. The cultural paradigms are not shifting, in spite of the various anomalies and numerous rumblings. Yet at the same time, the `environmental crisis' is growing more ever more serious and more immediate. Where Levins and Lewontin pointed out anomalies in the study of `natural' systems and proposed a way forward, and Lee pointed out anomalies in the philosophical and economic systems and also proposed alternatives, it remains up to geography to synthesize these two. It could be argued that as ecological stress mounts, it will become more and more expected of science and particularly of geography, that a *new* answer be found to the question Kates posed at the beginning of this dissertation; what is and ought to be our relationship with Nature? There is clear reason to believe that the old answer was inadequate. Yet it is crucial that the question, and the answers, be given as broad a hearing as possible. Certainly part of the strength of the DWEP is that its more extreme positions were seldom actually verbalized, they simply remain hidden assumptions to which people respond unconsciously.

Towards a new metaphor for geography

A deliberate and conscious shift in paradigms for geography on its disciplinary scale from its present atomistic reductionism which is manifest in the inability to find agreement even on the subject matter of the discipline to a paradigm more in sympathy with the assumptions of the Green Paradigm would have tremendous implications not only for geography, but also for science and society. It is the contention of this dissertation that it is the axioms of the DWEP which lie at the root of the `environmental crisis' and that a failure to address these axioms, deliberately and self-consciously, will mean a failure to find a solution to the problems. If geography is something of a backwater in science, falling as it does rather awkwardly between convenient categories; and if within geography, biogeography is itself something of a backwater, leaning rather too far towards biology for the liking of many; and if within biogeography, panbiogeography is something less than the main focus of study; then there is a rather satisfying irony in finding evolutionary scientists arguing that panbiogeography may provide the alternative to Neo-Darwinism for which they have been looking, and may even provide a metaphor for a new science (Craw & Page, 1988; Gray, 1988).

Geography is unclear about a number of things; the difference between development and evolution, for example; or whether the environment is separate and ontologically prior to the organism in posing functional problems to which it must adapt; the question of quite how people fit in to all this. The separating of human and physical geography is a sign that there remains a large measure of agreement that humans are somehow a special case, to which natural laws do not really apply in the same way that they apply to geomorphology or to climatology. Geographers might, at a push, accept that there is a link between the evolution of organisms like trees, and their environment, but seem resistant to the idea of extending this notion to include humans. Humans are, however, natural organisms, a point which geographers must accept unless they wish to subscribe to the notion that people were planted on the earth by alien spacecraft or some other extraterrestrial intervention. As was mentioned in the fourth chapter, Darwin, despite many claims to the contrary (e.g. Lewontin, 1983), did not see his biology as necessarily based on the separation of organism and environment. Indeed for him the organism took an active role in its interactions with its environment and in determining the course of its species' evolution (Ghiselin, 1986). The idea that organisms fit their environments leads to a very static conception of the organism-environment relationship. This is problematic in that it results in the creation of a picture of the organism as adapted, rather than adapting (Lewontin, 1981). Geography remains trapped in this functionalist approach, with two results. Firstly, the idea that the organism has adapted leads to the separation of human development from that of its environment, a sort of smug confidence that we have already adapted, and are just sorting out the finer details such as who will control the means of production. Secondly, to see something as adapted, it is necessary to make a comparative judgement (Gray, 1988); thus the question of whose adaptation is greater, advanced Euro-America, or primitive Africa, and thus a subtle input in to the whole development debate. The functionalist perspective creates a picture of organisms as passive objects shaped by the autonomous driving forces of evolution under pressure from the environment. Yet humans appear not to be passive, so again they are ontologically separated from the rest of nature. The result of this is a deterministic view of history, and support for the linear unfolding view of development, the underlying sense that we have reached an optimal state in our present position. The conflation of development and evolution, combined with an understanding of evolution which is in no small way Neo-Darwinist. Thus while geographers and other scholars of development recognize the inadequacy of equating development with progress along the Euro-American line, they are effectively trapped in to falling back on this premise by the hidden assumptions which underpin their disciplines. The cry that development is not an increase in GNP is a popular one, but the answer to the question which must follow: `fair enough, then what is it?' is a sort of team mumble.

There is a difference between development and evolution. Development is the result of integrated organism-environment systems. It is thus the heart of evolution, where this is seen as change in the distribution and constitution of developmental systems (Oyama, 1988). Failure to separate the two leads to an evolutionary determinism, particularly in a functionalist approach. Evolutionary determinism, failing to note the reciprocal interaction of organism and environment, assumes that deviations from the optimal relationship with the environment will have been selected against, and that the present state of affairs is optimal. This is taken to extremes when genes are assumed to be the fundamental level of explanation; indeed functionalism as it is presently formulated requires a committment to one level of analysis as ontologically prior to others (Gray, 1988).

In reality, however, neither organism nor environment pre-exist their relationship. They are mutually constructed in a mutually constrained manner through ontogeny. Where it is recognized that experience of the environment plays a role in the construction of the phenotype of the organism (e.g. Bateson, 1983), it is less often emphasized that the organism selects and modifies its own environment based on the available materials, not only through obvious constructions like beaver dams and coral reefs and London, but through more subtle forms such as the release of chemicals (Gray, 1988).

In order to summarize this view of development where internal and external factors are co-defining and co-constructing, Gray uses the metaphor of `reciprocally constrained construction' (1987). He emphasizes that the kind of construction intended in the metaphor is not that guided either by a genetic blueprint or programme since that type would be unable to be truly reciprocal insofar as the genes would be given prior ontological status. Instead he envisages construction as "a process of self-assembly or self organization where the term `self' refers to the organism-environment system" (Gray, 1988, p. 219). A similar point is made when it is suggested that development is analogous to an idealized process of ecological succession. In this ecological succession proceeds in an orderly manner because of the regular sequence of interactions between organisms and their environments. It does not require an ecological blueprint or programme, yet the absence of an underlying programme does not imply that the process of reciprocal construction can proceed in any direction. Rather it is constrained by the current state of the organism (which is a result of past interactions) and the current environmental context (Stent, 1981). This expanded sense of *Self* to which Gray refers is remarkably similar to that postulated by Deep Ecologists in the previous chapter, yet where theirs was based more on social and philosophical grounds, it is presented here in terms of evolutionary biology.

The evidence is overwhelming that a) organism and environment develop and evolve together, and b) people are natural organisms. This suggests the need for a method that reveals the geological, the geographical, the ecological, and the developmental contingencies of evolutionary transformations. Croizat's (1958, 1964) panbiogeography can be regarded as an attempt at such a project (Gray, 1988).

Croizat's view of evolution is encapsulated in his expression "earth and life evolve together" (1964, p. 46). This statement can be read in two ways: one, favoured by vicariance theorists, is that it implies that geological changes are the major factor in evolution. The other interpretation suggests that there is a more symmetrical relationship between earth and life. Although Gray (1988) contrasts these, he notes that Croizat appears to support both views at different times. They are, in fact, not necessarily contradictory. Noting that geological changes are major factors in evolution does not mean that other factors are irrelevant. For Croizat:

> "... all the factors in the equation, biogeography, biology, ecology, and finally geography, interlock of necessity so closely as to rule the possibility that one can be thought to come in to being without the others jointly and simply proceeding *pari passu*" (1958, p. 801)

and

> "... the `island' no more came first than did the `bird' dwelling on the island" (1958, p. 919).

Croizat regarded life as being a geological layer on the planet, and his conception of life and earth evolving together is remarkably compatible with the Gaia hypothesis in ecology, that there is a process of dynamic equilibrium between the Earth's atmosphere and the life maintained within it, and which it in turn maintains, a point expanded on in the previous chapter. Lovelock (1988) argues that without the presence of life on the planet, the atmospheric conditions would be very different to those pertaining at present: for example 98% CO_2 instead of 0,03%; 1,9% Nitrogen instead of 79%; 0,0% oxygen instead of 21%; and a surface temperature of 240-340 centigrade instead of the present 13 degrees centigrade. There is clearly a warning in this for the `burn the rocks and dredge the sea' school of economics; destroy too much life, and you destroy all. The question, of course, is where the limit lies.

Panbiogeography offers a useful relational concept of an interrelationship between space, time, and form as the explanatory approach to biogeography. This collapses the organism-environment dualism into a threefold parallelism. Space and time are no longer absolute categories, but relations on form, where form is understood as the structural, functional, and behavioural aspects of organisms. Similarly form ceases to be an absolute category (e.g. an organism), but a relation on space/time (Craw & Page, 1988).

There is untold richness here for the formulation of a new geography. From development biology comes the idea that integrated systems can frequently respond appropriately to perturbations. From behaviour comes the realization that behaviour is not simply a product of evolution but is simultaneously an agent for further change. From ecology comes the interconnection of organism and environment, and from panbiogeography comes a method for historical reconstruction and a spirit of synthesis (Gray, 1988). The problem is to put all this together.

A new geography is necessary. A new geography is impossible under the DWEP, because the institutional paradigms of economics, of politics, and even of science, framed as they are within that fundamental assumption of the DWEP that people are separate from nature, dictate the questions which can and cannot be asked. A politically naive physical geography does not recognize its own limitations. An ecologically naive human geography does not recognize the problem. A paradigmatically naive geography does not recognize either the causes or the manifestations of the problems it faces. A Green geography must accept, at the outset, that any problem is imbedded in a physical and social matrix. Thus a large drought in Africa may be the result of overgrazing and a raised albedo, and this may be as a result of economic pressures and inappropriate technology. Or it may be the result of a decrease in rainfall. But a decrease in rainfall may be as a result of a loss of sulphur releasing plankton in distant oceans, which means the loss of sulphur in the air, which means a reduced potential for rain because raindrops often form around a sulphur nucleus. And the loss of plankton may be a result of higher sea-surface temperatures or a result of the ozone hole. On the other hand, low rainfall may be a result of the teleconnections between El Nino and the Southern Oscillation. It may be all of these, or a combination of some. It may be something else entirely. A Green geography, taking as its field of study the interactive process between form (the organism-environment interaction) and space-time may find it necessary to use abstraction as a technique to study any one of these components, but the ethos of the discipline would be one of synthesis, a desire to see the larger picture as it unfolds. At present geography does sometimes claim to be a discipline of synthesis, and there may be a genuine desire by some geographers to work on this synthesis. The physical, social, and financial constraints of the DWEP within which geography is contextualized renders this synthesis impossible.

The Green Paradigm is based to a large degree on a recognition of the limitations of the DWEP. It recognizes that valuable contributions to human development have been made in the past. It equally recognizes that massive devastation has been caused, and indeed that this devastation is continuing and will eventually threaten even those it does not yet. It is not only the assumptions of the DWEP which are problematic, it is the way they interact to create systems; economic, scientific, social. It is, at times, necessary to identify oneself as a unique individual, to abstract oneself from ones surroundings in order to recognize ones own potentials. The fatal flaw of the DWEP was to make this abstraction definitive.

Instead the Green Paradigm recognizes that there is a dynamic tension between the sense of oneself as a unique individual, and the sense of being a part of a greater system. They need not be exclusive. There is a dialectical interaction between the two which is where the greatest potential for Self-actualization lies.

We cannot build a geography, which is a particularly human endeavour, without recognizing that we are human. Yet in recognizing this, we must recognize that we are part of a larger system, and that geography (like other human occupations) therefore has links and impacts which are not exclusively human. A Green geography must necessarily be a unified geography. There is a place for studying interactions which are specifically between humans, and there is a place for studying processes which do not have an obvious human component. Yet in making these abstractions for the purpose of study, it remains necessary to recognize that they are *artificial* abstractions, and that the world is not really so constituted. The main thrust of a Green geography should be on the links, the interconnections which have been ignored in the reductionist abstraction of science under the DWEP. There is an entire field of study which has been barely touched, and yet which forms, and which has always formed, the central focus for geography.

A Green geography is infinitely more complex than the old one. It may even be too involved, simply too difficult to put together; too unwieldy to use. It is, however, crucial that the attempt be made. Only a Green geography can provide the framework and the analytical tools which are required to address the 'environmental crisis' because only a Green geography can see this crisis as a symptom of a maladaptation by humans to their environment. Only a Green geography can develop the metaphors appropriate to an understanding of the world which sees organism and environment as a single process. Evidence from ecology, from biology, from quantum physics, and from biogeography suggests that reality is an interconnect whole, linked in some ways we have recognized through accidentally stumbling across them, and presumably in untold ways we have not yet discovered, at least in part because we have not looked. From chaos theory in physics, in climatology, in ecology we learn that these links and relationships are in all likelihood non-linear, and not necessarily obvious, but that this does not make them unreal, and nor does it make them unstable. Also from chaos theory comes a fundamental insight, sensitivity to initial conditions and positive feedback. If Green thinking is accused of teleological tendencies, then it is this point which suggests otherwise. The organism and the environment may define one another, but not all fits need be perfect. Development may be thought of as attempting to find an appropriate fit. Organisms remain discrete entities on an individual level. In the case of humans, there is little doubt regarding the capacity for free action and a choice between behaviour which is appropriate or inappropriate. A common response to the idea that people are a part of the planetary system is to use this to argue that all human behaviour must therefore be appropriate since it is `determined' on a sort of instinctual level and that in the long run the planet will be able to sort everything out. In terms of the lifespan of the planet, this is probably true. Extinction is a perfectly natural phenomenon, and is only to be expected if an organism overuses its resources. Such an argument runs counter to normal human logic, however, in that extinction of ones own species can not, from the perspective of that species, be regarded as an appropriate adaptation. Green thinking does not deny humans their humanity, it suggests that this potential is best realized when the larger context is acknowledged.

A Green geography need not necessarily limit itself to huge complex issues like the fate of the world. It offers insights in to traditional concerns of normal geography; social justice, spatial inequalities, development, physical processes, the whole gamut. It provides an entirely different context for the ongoing sustainable development debate, although that particular idea is so colonized and so white-anted that it is perhaps best abandoned.

A simple application of Green thinking might be as follows: an issue as supposedly `green' as nature conservation takes on a different hue and is revealed as something which can easily be selfish and anthropocentric. Conservation generally does not grant nature any value of its own, it remains something to be saved for human enjoyment. Similarly it entrenches the power relationship between humans and nature, and fails to address the real question of why `nature' should need to be conserved in the first place. This does not, however, mean that in the present context such conservation is wrong - far from it, it is a necessary evil. It is, however, a function of the Dominant Western Environmental Paradigm. Without a change in cultural paradigm there is little alternative. This remains true even for individuals involved in conservation. It is possible that they may accept, in their individual capacities, the insights of the Green Paradigm. Individuals who are in close contact with `wild' nature frequently come to see it as having a value in itself, and no-one who has accidentally wandered into a heard of elephants can deny their intelligence, but these people remain forced to justify their concerns in terms of the values of the old paradigm. Hence the peculiar notions such as `saving' rhinos by farming them for their horns, in the belief that the only real justification for saving anything is its ability to make someone money.

Tourism is a more complex example. On the surface at least it is indefinitely sustainable. The impact of tourism on Communities, and here Community is used to indicate both human and the non-human Nature, is seldom considered. Cape Town offers a concrete example. The inhabitants tend to resent tourists, and are often quite insulting to them. On the other hand the tourists feel they are spending good money, and are entitled to at least civil treatment. Again it is a question of values. Capetonians identify strongly with *their* mountains, *their* beaches, *their* wines and restaurants. Tourists come between the inhabitants and their environment, jamming roads, restaurants, and beaches. In return they offer money. How much ever really trickles down to the average inhabitant is moot, but by seeking to offer financial compensation tourism misses the vital point. Deep Ecology highlighted the expanded sense of Self which comes from identification with one's environment. Tourists are thus offering money; a deliberately impersonal thing, in exchange for some of the *Self* of the locals[7]. Mass tourism, package deal holidays in hotels well away from where locals live, does not offer the tourist an opportunity to give something of themselves in return. They impact on Nature and go, leaving money to tidy up the mess. It cannot.

The energy example is as relevant in economics as it is in technology. Each step up the energy ladder has meant increasing concentration of power, of wealth, in the hands of fewer and fewer. Even if fusion did manage to overcome its multitude of problems and provide limitless energy, it would hardly be free. Very few individuals would be able to afford their own plants, they would be forced to buy the energy. One must question the massive investment in such concentrated energy sources when alternative technologies offer more hope of success. The economic system seems to be aimed not to empower the individual at all.

It is for these reasons that many of the suggestions which come from within the Green Paradigm tend to stress decentralization and community-lifestyles. Small communities offer more potential for self-sufficiency, in energy production, in food production, and economically. They are more sustainable than megalopolis'. Small-scale economics of the type suggested by Schumacher offer greater identification with the individual's work, helping to overcome the alienation of being a small cog in a big machine. Technology can again help or hinder - microcomputers and international communications can allow almost anyone the capacity to work from home without having to become a woodcarver. Decentralized economics allows the accountant the chance to live, and work, next door to the woodcarver. It offers, as

7 In the case of Cape Town this is compounded by the fact that locals already receive significantly lower wages than they would receive doing the same job in another, but less attractive, city elsewhere in the country.

Schumacher said, an economics as if people mattered. It also offers an economics as if Nature matters. This does not, however, mean a return to some romanticized pre-industrial golden age, nor a stubborn rejection of technology. Indeed there is a great deal of freedom, particularly freedom of action and choice, to be found in large cities, which is stifled by the parochialism of small communities. There are no simple answers and no easy answers, and this dissertation has not been constructed to provide a guide to Green living. Ultimately the choices will be made individually, and socially; based, of course, in an historical context. Geography has a role to play in answering all these questions.

Conclusion

The paradigm concept in its formulation, as used here, of a *cultural paradigm*, offers invaluable insight into the development of thought systems and perceptions. It has allowed the identification of what has been called a Green approach, in spite of some major disagreements between various schools of thought operating within the approach. These differences, when taken to be facets of one paradigm, lose much of their bitterness, and can be recognized to be mutually supportive, rather than antagonistic as they first appear. They can legitimately be seen as an healthy feature.

Sufficient consensus exists in two distinct schools of thought on human-nature interaction to allow the identification and comparison of the Dominant Western Environmental Paradigm with the Green Paradigm. Such a comparison suggests that the Green Paradigm is more internally coherent, and is more amenable to the insights of science and society than is the dominant cultural paradigm.

The Green Paradigm is poorly developed; it has not had the concentrated effort and attention which has been lavished on the DWEP. Not only that but since the Green Paradigm undermines, rather than entrenches, abusive power relations with Nature, it must be anticipated that it will remain unacceptable to those individuals who require such dominance for the health of their Egos. After all, the Dominant Western Environmental Paradigm became dominant because it permitted unbridled exploitation. Humans have conquered the planet, however, and cannot continue beating it into submission. Now they must learn to live as a part of it. The Green Paradigm, with its ethic of co-operation rather than conflict, is a step in that direction. It also provides a framework for a science which is intended to assist in the fulfillment of that goal of co-operation. Geography is ideally placed to take advantage of the disciplinary framework provided by the Green Paradigm, and to become a truly integrative and holistic discipline.

Conclusion

Apart from the identification of some of the fundamental assumptions of each of the cultural paradigms here contrasted, this dissertation has not attempted to produce definitive identifying lists of the features of each paradigm, nor of its advantages and disadvantages. This has been deliberate, in the belief that it is the whole tapestry which is important, and not the various constituent threads. Indeed in some cases the two paradigms use the same thread to produce different pictures. To concentrate on the threads would be to capitulate to the reductionism which is so deplored here. Hopefully sufficient detail and explanation has been provided for the reader to put together a working model of the paradigms, and to appreciate both the different frameworks provided by the two cultural paradigms, as well as the different pictures of the same scene that the two provide. The usefulness of the concept of a cultural paradigm as an analytical tool should be apparent in its ability to accommodate and even to contrast normally incomparable categories, and to see similarities where differences are more commonly assumed, as in the links between Marxist and capitalist economics. Similarly it is hoped that the concept of the articulation of paradigms, with the dialectical interaction between paradigms on different scales may not only cut through some of the confusion which seems to surround the word `paradigm', but which also suggests how and why geography requires a Green disciplinary paradigm, and how the adoption of such may tip the scales in the ongoing struggle between the two cultural paradigms for a major place in the Western world-view.

In conclusion it has been argued that there are two distinct interpretations of the human-nature dichotomy, and that these two may usefully be characterized as cultural paradigms, as parts of the Western cosmology. It has further been argued that adoption of the DWEP as the appropriate framework for human-nature interaction has led to a process which has led to greater and greater domination of Nature in an attempt to both support the axiom and to actualize its implicit assumption. It has further been argued that science has, in the course of the development of the DWEP, been subordinated to the assumptions of a rationality which has ideological roots in the nineteenth century in terms of which `economic man' is elevated to a position at the top of an evolutionary pyramid. It has been suggested that as a result science has lost its autonomy, and geography in particular has become increasingly unable to either conceptualize the problems with which it should be dealing, or to offer critiques or solutions. A position which has been maintained throughout this dissertation is that geography is the appropriate science for the study of the human-nature interaction, although there is obviously a role for other disciplines. A second position which has been maintained is that the `environmental crisis' is real. In this dissertation the crisis has been characterized as being the result of an inappropriate interaction between humans and their environment. It has been concluded that the subordination of science to the dictates of economic rationality has made it impossible for geography to adapt so as to deal with the problems, and that if something is to be done, a reconfiguration of geography within the Green Paradigm is necessary. An outline of the direction this reconfiguration might be expected to take has been presented. Further work on this new structure for geography is obviously needed, but is beyond the scope of this dissertation.

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