Policy Futures in Education

On Science, Ecology
and Environmentalism

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ABSTRACT Using ecological science as a backdrop for this discussion, the author applies Michel Foucault's historical genealogical strategy to an analysis of the processes through which sustainable development (SD) gained hegemonic acceptance in the West. She analyses some of the ideological mutations that have seen SD emerge from an environmentalist ideology based on ecological science to that of a mainstream market-oriented ideology for global economic development. This involves canvassing the voices of early environmental authors and ecologists, whose ideas such as 'carrying capacity', 'limits to growth' and 'finite resources' have been co-opted by the 'sustainable development' movement. It is argued that a discursive political and philosophical conservatism has muted the potential for a truly radical ecological approach.

This article will treat the science of ecology as a touchstone from which the discourses of environmental crisis and environmentalism gained momentum during the 1960s and 1970s in the West. Such an analysis provides an opening to unravel a genealogical history of environmental thought. For this article I am particularly interested in environmental and sustainability discourses as they have emerged from the science of ecology.

Environmental philosophy has, since the 1960s and 1970s in particular, drawn on the science of ecology to highlight the dependence of humanity on ecological systems as critical for future survival. The principles of ecological science are worth briefly sketching at the outset. Merchant sums these up nicely:

> The science of ecology looks at nonhuman nature, studying the numerous, complex interactions among its abiotic components (air, water, soils, atoms and molecules) and its biotic components (plants, animals, bacteria and fungi). (Merchant, 2005, pp. 7-8)

Broadly speaking, environmentalisms take the principles of interaction, relationships and systems from ecological science to situate humans within the nonhuman world, stressing their dependence on the earth.

Environmentalist philosophy offers a critique of western assumptions that view man's relationship to nature as separate from nature. Environmentalists point to human dependence on and connectedness with nature. However, it is important to note that environmentalism is not a singular philosophy, but rather embodies a number of discourses that support the political aim of protection of the environment. There is a range of positions relating to this, from 'shallow green' managerial views to a 'deep green' commitment to non-interference with the non-human world (Hay, 2002).

For those of light green persuasion, managing 'natural resources' and conservation measures are important premises for policy making to mitigate against the impact of humans on the earth. For those on the dark green or 'deep ecology' side, however, this view does not go far enough because it depicts humans as 'outside' of nature, and as such is critiqued as essentially 'homocentric'. David Suzuki epitomises this dark green position, saying that '[t]here is no

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environment "out there" that is separate from us. We can't manage our impact on the earth if we are the surroundings' (Suzuki, 2008).

As an environmentalism, 'deep ecology' seeks to motivate individuals through adherence to normative underpinnings that see all life on earth as interdependent and as having inherent value. In 1984 Arne Naess developed a set of philosophical premises underpinning deep green environmentalism as a platform from which to base policy development (Hay, 2002) These include an ecocentric perspective, whereby human and non-human life are of equal value and have an 'inherent worth' that is 'independent of the usefulness of the non-human world for human purposes' (Naess, 2003).

It is not within the scope of this article to detail all the genealogical influences of environmentalism, but it is worth noting that as well as relying on the science of ecology to support its claims, it has it has drawn on a number of ideas. These include those of the knowledge systems and spiritualities of indigenous peoples, phenomenological thought such as Heidigger's dwelling-in-place, eastern religions such as Buddhism and the Tao, western physics and new physics, ecology and certain Christian traditions (Hay, 2002).

Science is an important genealogical influence to focus on as it operates as what Foucault terms a 'truth model' (Foucault, 1994a) This means that environmentalist discourses do not 'stand alone'. They gain credibility – come to be seen as true or false - in relation to science as a 'truth model'. This has real material consequences as in the prioritising of economic, social and environmental policy in line with scientific worldviews. As Taylor and Buttel (1992) have shown, 'science has a central role in shaping what count as environmental problems' (p. 405).

This article stresses the 'legitimation' function of scientific research in environmental and sustainability politics. The discourse of 'crisis' central to these movements is legitimated by the assumed truth and neutrality of science. Further, it motivates political action through what Harvey calls 'the politics of fear' (Harvey, 1974, p. 241). The received conventional assumption that science is 'objective' and 'neutral' has been challenged by scholars such as David Harvey (1974). According to Harvey (1974), this is because 'scientific enquiry takes place in a social setting, expresses social ideas, and conveys social meanings' (p. 215).

This article will tease out the underpinning economic imperatives and value systems in environmentalist discourse, including sustainability. The neoliberalising of nature evident in sustainability discourse indicates a hegemonic and constraining worldview held by those using it. Conservation of ecosystem 'services' and the 'natural resource base' are presented in much sustainability policy literature as serving the needs of development and quality of life. In relying on the science of ecology, environmentalism has also inherited some of its unstated positivist assumptions. These themes will be explored in this article in relation to key underpinning ideologies.

Deeper questions need to be asked in the quest for a more robust and transparent philosophical rationale for environmental action. It is my contention that important questions about the relationship between humanity and nature become sidelined in the face of a political furore over whether the environment really is at the 'tipping point' or not.

Method

The following discussion attempts to employ Foucault's genealogical analytical strategy. Writing history through Foucault's genealogy method may best be described as focusing on what it is *not*. It is not a description of events that attributes causal relations between social conditions and ideas (Foucault, 1994a, p. 283). As such, this article does not trace the development of environmentalism as simply resulting from an awareness of the impact of humans on the biosphere.

Social conditions and environmental destruction are of course important in tracing the genealogy of an environmental and sustainability discourse – but not in the sense that they can be construed as *explaining* a particular progressive historical trajectory of these ideas. For Foucault, worldviews and social practices are not causative, but rather are constitutive of the relations within which particular discourses play out. As Merchant explains, a positivist, mechanistic and instrumental worldview of nature developed 'simultaneously with and in support of early capitalism' (Merchant, 2005, p. 11). In this sense, ideas are power in that they justify particular

modes of production. The *aim* with Foucault's genealogical analysis is to 'query the discourses and practices of the present by referring them back to the hegemonic conditions under which they have been established' (Andersen, 2003, p. 20).

Capitalism is now the dominant global economic system, and for it to expand and function optimally, ideologies must support it. Modern worldviews arose out of the work of sixteenth-century scientists breaking from the traditions of ancient science. An example of this can be found in the works of Francis Bacon (1571-1626), who offered a critique of ancient science which he claimed 'touched nature only "by the fingertips"' (Pesic, 1999, p. 82). Following a line of thought that had been developing in the preceding century, Bacon believed that nature needed to be subject to 'penetrating interrogation' in order to reveal its secrets to benefit humankind (Pesic, 1999, p. 93; Merchant, 2005, p. 45). This has formed the basis of modern scientific experimentation, technological development and domination of nature for the benefit of humans. It stands in direct contrast to earlier worldviews of the earth as 'a nurturing mother with respiratory, circulatory, reproductive, and elimination systems' (Merchant, 2005, p. 41). In the scientific worldview, earth is 'dead and inert, manipulable from outside and exploitable for profits' (Merchant, 2005, p. 41).

The concept of discourse as it has been developed by Foucault is useful in interpreting the way in which meaning and truth are formed through political structures (Foucault, 1994a, p. 15). Discourses are 'models of truth', and they circulate in society. According to Foucault (1994a, p. 15), they operate in the 'political domain' and in 'the domain of everyday behaviour', and also in the 'realm of science'. For Foucault (1994b), truth becomes a 'regime', and thus constitutive of the power structures in society. The production of truth in modern capitalist societies is focused on science and the institutions that produce and disseminate it - that is, the 'university, army, writing, media' (Foucault, 1994b, p. 131). Foucault also talks about 'ideological struggle' in this process of production and dissemination (Foucault, 1994b, p. 131). This article will illustrate some of these struggles in the arena of science, education and environmentalism.

Fairclough (1992, p. 8) likewise argues that language performs many functions that are linked to power. He categorises one of these functions as '"ideational" ... its function in representing and signifying the world and our experience' (Fairclough, 1992, p. 8). Through this function, the embedded values and rationalities of a particular discourse become part of our consciousness. They construct our selfhood and 'colonize us - gifting us with our existence and shaping our desires, our beliefs in what is right – the things we are prepared to die for' (Davies, 2005, p. 2). Merchant argues that the scientific and mechanistic worldview of nature has 'permeated and reconstructed human consciousness so totally that today we scarcely question its validity' (2005, p. 47).

Fairclough notes that 'a particular set of discourse practices and conventions may achieve a high degree of *naturalisation* – they are seen to be "there" in a common sense way, rather than socially put there' (Fairclough, 1992, p. 9, original emphasis). Discourse analysis helps us to understand the way that dominant 'models of truth' such as science are not 'neutral'. Rather, discourse must be seen in a relational sense – that is, it will have a relationship with 'dominant or dominated groups' in society (either ideologically supporting their struggles or not) (Fairclough, 1992, p. 9).

Currently the dominant language of the state in the West is that of the neoliberal government (Davies, 2005, p. 6). Giroux defines neoliberalism as a 'virulent and brutal form of market capitalism' (Giroux, 2005, p. 2). This article will explore some of the ways in which the dominant neoliberal discourse has 'colonised' environmentalist thought and action, subsuming it under the project of 'sustainable development'. It will also explore the various discursive struggles science has engaged with in the ideological maintenance of environmentalist and economic agendas over time.

So the question to begin with is this: what historic hegemonic conditions did the 'sustainable development' discourse develop? According to Foucault, we can begin answering such a question by looking at the disruptions in tracing a line thought and the socio-historic conditions within which the disruption occurred. The genealogical line that this article traces is that of ecological science, canvassing its various mutations into environmental politics, deep ecology and sustainability.

Scientists and Biologists in the 1960s and 1970s: 'canaries in the coal mine'

The second half of the twentieth century saw concern over the environment becoming an increasingly prominent social issue. This section will draw on the seminal work of population biologists and ecologists from the United States during the 1960s and 1970s. During this period the state of the environment was brought to public attention by ecologists and population biologists. Rachel Carson (Carson, 2002), Garett Hardin (Hardin, 2005), Paul Ehrlich (Ehrlich, 1971) and Ray Dasmann (Dasmann, 1972) were all biologists from the United States influential in establishing environmental concerns and motivating grassroots environmental movements. The conflict between industrial and economic growth and concurrent environmental concerns are central to these politics.

The placing of environmental crises within the boundaries of science has lent credibility to the concerns of environmentalists. It has created humans as 'subjects of a vulnerable existence'. This is particularly well demonstrated in the work of Rachel Carson, an American marine biologist and wildlife writer. Her 1962 publication *Silent Spring* was a landmark in drawing public attention to the effects that the chemical industry was having on the public and the wider environment.

The environment for Carson consists of complex and interrelated ecosystems. Her respect for the intimate and balanced inter-relationships between species on earth is illustrated with numerous examples. For example, she wrote:

> Water must be thought of in terms of the chains of life it supports – from the small-as-dust green cells of the drifting plant plankton, through the minute water fleas to the fishes that strain plankton, and are in turn eaten by the fishes and by birds, mink and racoons - in an endless cyclic transfer of materials from life to life. (Carson, 2002, p. 46)

Carson (2002) goes onto explore how synthetic chemicals used for pesticides -in particular DDT (dichlorodiphenyltrichloroethane) - during the post-World War II period were entering lifecycles, leading to what she called 'biocide'. She highlighted the links between humans and their environment by illustrating the problems of human consumption of DDT through this process:

> What of the opposite end of the food chain, the human being who, in probable ignorance of this sequence of events, has rigged his fishing tackle, caught a string of fish ... and taken them home to fry for his supper? (Carson, 2002, p. 49)

Carson was reacting against what she considered the mismanagement of toxic pesticides by the chemical industry and agriculturalists for their own profit (McCord, 2008). Paradoxically, science not only provided the evidence Carson needed to demonstrate human reliance on earth's natural systems, it had also become a handmaiden to the demise of these systems.

Carson's exposure of the chemical industry is an important environmental precedent. She showed how the chemical industry was the child of the Second World War (Carson, 2002, p. 16). In *Silent Spring*, Carson attempted to demonstrate that DDT and synthetic chemicals were not 'heroes', but, rather, were 'elixirs of death' (Carson, 2002, p. 15). Differing from earlier pre-war insecticides that were made from mineral and plant products, the new synthetic chemical insecticides were originally intended as 'agents of death for man' (Carson, 2002). Carson claimed that these chemicals 'enter the most vital processes of the body and change them in sinister and often deadly ways' (p. 16). She illustrated the staggering degree to which DDT could be located in the tissues of a wide variety of life forms, including 'fish, birds, reptiles, and wild and domesticated animals' (p. 15). As she also argued (p. 15), it could be found in humans, maternal milk and probably even unborn babies. Furthermore, she pointed out that there was no mechanism for accountability regarding the potentially destructive effects of DDT on humanity and other living organisms (Lear, 2002).

Carson's claim that the growth of the chemical industry was detrimental to the public good set in motion its own chain of events. Maguire (2004) explored the way that discourses around DDT have influenced popular discourse and policy. He specifically links this to Carson's influence. He writes: 'Subsequent to *Silent Spring*, the quantity and quality of the policy discourse changed dramatically. One after another, a series of government reports reinforced a technological frame that highlighted "the pesticide problem"' (Maguire, 2004, p. 126).

The ideational function of discourse is revealed in the above discussion on DDT. Discourse represents everyday material substances like DDT (Maguire, 2004). DDT is at once a material substance and an idea. Its meaning is conveyed by the use of the word 'insecticide'. Maguire's analysis of DDT shows that its discursive representation over time led to both its rise and its fall – from becoming a solution to becoming a problem.

> Just after the Second World War, constructing an insecticide as having 'long, persistent action, i.e. good chemical stability' was generally good for sales because this 'residual effect' lowered insecticide costs. In contrast, by 1972, attaching the concept of persistence to a particular insecticide risked not being able to sell any of it. (Maguire, 2004, p. 120)

Carson's critique of pesticide firms involved accusations of their self-serving interests. She alerted the public to DDT's potential to cause 'cancer and neurological disorders' (Ricketts, 2010). While the initial critique of DDT was confined to the closed circles of 'scientific disciplines and government bureaucracies', Carson's work was instrumental in motivating the public (Maguire, 2004, p. 117). The ultimate result was the banning of DDT after a series of congressional inquiries (Ricketts, 2010, p. 21).

Much has been written about Carson and how she used nationalist rhetoric mingled with easily accessible scientific jargon to garner public support for political change (see e.g. McCord, 2008). For example, she evokes the pastoral imagery of the American countryside of yesterday 'where all life seemed to live in harmony with its surroundings' and contrasts this with a dying and silent land where there is 'a rain of poison falling from the skies onto the world of wildlife' (Carson, 2002, p. 86). This conjuring up of an American frontier and 'historically fantastic notions of the American West and its awesome, rugged landscape' presented an 'idyllic nature devoid of human interference' (McCord, 2008, p. 15). In Carson there is no radical left critique of colonial expansion and the impact this has had on the environment, but rather an indictment of the chemical industry and its excesses. Her writing was still very much located in the positivist scientific intellectual tradition (McCord, 2008).

She also talks repeatedly of the 'consumer', 'consumer protection' and the 'public', appealing to liberal democratic notions, and revealing a reformist agenda rather than a radical critique of market capitalism (Carson, 2002; McCord, 2008). Carson's solutions were reformist, and detailed the need for corporations and science to be regulated in the interests of public health and the environment (McCord, 2008). Nevertheless, her impact has been significant in underscoring environmentalist thought and building critique about the human and environmental exploitative features of economic corporations.

Another early conservation biologist was Raymond Dasmann (Dasmann, 1972). His work in the 1960s on threats to the planet by environmental problems culminated in a number of books. His 1972 publication *Planet in Peril? Man and the Biosphere Today* clearly signifies the notion of crisis. He defined the 'proper' goals of conservation as

> achieving a high material standard of living based on rational use of the Earth's resources. There is no necessary conflict between conservation and technology or conservation and international development. Only with the aid of the highest technology can the goals of conservation now be achieved. Only through adequate attention to ecological knowledge and conservation values can the goals of economic development be achieved without serious and unwanted environmental disruption. (Dasmann, 1972, p. 124)

Dasmann's work signals some key themes that have become central to environmentalist thinking. One key theme is the attempt to balance economic and technological development with ecological concerns. Dasmann's unquestioned faith in 'rationality' and his embracing of technological and economic development as a 'good' in improving the material conditions of humanity (particularly the underprivileged) reveal an interesting political conservatism.

Dasmann's work is based on modernist rationality which in turn stems from the Cartesian separation of mind and matter. Like Carson, Dasmann signals the status and importance of 'ecological knowledge' in guiding the premises of economic development. On the surface this claim seems benign enough, but scientific ecological knowledge has been critiqued as being based on a mechanistic worldview that reduces nature to 'a system of dead inert particles moved by external rather than inherent forces' (Merchant, 2005, p. 47). In this way, ecological science

embodies a view of nature that regards it in terms of physical laws, sees it as a system of parts that work like a machine (Howarth, 1996).

Furthermore, ecological science is based on the assumption that humans are (in a sense) apart from nature, that they can discover its workings and wrap them up in commodified, value-free packages of 'facts' that can be apprehended through human rationality. These assumptions, very evident in Dasmann's work, mean that his critique of the impact of industrialised capitalism on the environment becomes disciplined through the conservative forces of modernist rationality.

Dasmann goes on to tackle the difficult territory of 'high levels of consumption' and 'the wasteful ways that have characterised certain sections of humanity' (Dasmann, 1972, p. 125). While acknowledging that not all people can live this way, Dasmann remains convinced that given a rational choice, no one 'really wants to live that way' (Dasmann, 1972, p. 12). He goes on to refer to alternative 'pleasing ways of living' that can be 'sustained' with some level of permanency (Dasmann, 1972, p. 12). Human progress, for Dasmann, is based on the modernist assumption of technological and scientific progress.

Another significant piece of literature during the 1960s was Paul Ehrlich's 1968 book *The Population Bomb*. Ehrlich was a Stanford entomologist whose neo-Malthusian warnings were conveyed to the public (Ricketts, 2010). He warned that

> [t]he battle to feed all of humanity is over. In the 1970s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now. At this late date nothing can prevent a substantial increase in the world death rate. Ehrlich, 1997)

Ehrlich was convinced that increasing human population and scarce resources were going to intersect with devastating results for human survival. In a recent article, he maintains that '*The Population Bomb* helped launch a worldwide debate that continues today. It introduced millions of people to the fundamental issue of the Earth's finite capacity to sustain human civilization' (Ehrlich & Ehrlich, 2011, para. 2).

Hardin (2005) describes himself as a 'genetically trained biologist'. He wrote an essay which built on the arguments made by Erlich (Ehrlich, 1971). This essay added yet another argument about human greed and competition resulting in the destruction of the natural world. In this essay, Hardin asked 'is this a finite world?' The concepts of 'finite' and 'limits' were in contrast to the dominant ideology of 'growth' (Hardin, 2005).

Hardin's writings are eloquent and descriptive. He evokes the notion of 'carrying capacity' to portray the earth's limits. The following quote comes from the 1968 in *Science* magazine called 'The Tragedy of the Commons':

> The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. (Hardin, 2005, p. 28)

For Hardin, the tragedy of the commons results because humans acting as 'independent, rational, free enterprisers' are compelled to increase their herd and outstrip the carrying capacity of the land (2005, p. 28). He argues that 'freedom of the commons' leads to its demise (Hardin, 2005, p. 28). His conclusion is that '[t]o couple the concept of freedom to breed with the belief that everyone born has an equal right to the commons is to lock the world into a tragic course of action' (Hardin, 2005, p. 31).

Hardin's arguments concerning population growth also built on the Malthusian thesis that attempts to alleviate poverty were misguided and that we should ignore the starvation of the poorer classes (McNally, 2000). In a similar vein, Hardin writes:

> Without some system of worldwide food sharing, the proportion of people in the rich and poor nations might eventually stabilize. The overpopulated poor countries would decrease in numbers, while the rich countries that had room for more people would increase. But with a well-meaning system of sharing, such as a world food bank, the growth differential between the rich and the poor countries will not only persist, it will increase. Because of the higher rate of population growth in the poor countries of the world, 88 percent of today's children are born

poor, and only 12 percent rich. Year by year the ratio becomes worse, as the fast-reproducing poor outnumber the slow-reproducing rich' (Hardin, 1974)

The 'lifeboat ethics' proposed by Hardin were that governments should treat countries like individual lifeboats and not offer to alleviate the distress and suffering of those in overcrowded and under-provisioned circumstances.

Hardin's concept of 'carrying capacity' has survived to inform mainstream environmentalist discourse. It is based on the Malthusian natural economic laws and rational choice theory that humans act rationally and in their own self-interest (McNally, 2000). It is anti-radical and represents a 'naturalistic discourse of poverty' (McNally, 2000, p. 440). The power embodied in scientific inquiry that links to this discourse is disastrous for vulnerable poor people. For example, Harvey (1974) explored the he links between scientific inquiry and political consequences, arguing that 'scientifically based' theories of overpopulation and scarcity of land resources have historically had 'profound political implications' (Harvey, 1974, p. 213).

The Broadening of the Crisis Discourse

During the 1960s and 1970s, the way in which economic development and population growth were impacting on the environment became a central political issue and was signified in the discourse of 'limits'. One of the earliest proponents of this discourse was the Club of Rome. The Club of Rome has been described by one of its members as 'an international group of distinguished businessmen, statesmen and scientists' (Meadows et al, 1992). The report *Limits to Growth* was a study commissioned by the Club of Rome (see King & Schneider, 1993). It was published in 1972, and in total around 10 million copies in 30 different languages were produced (King & Schneider, 1993). *Limits to Growth* concluded with the following statement:

> If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged the limits to growth on this planet will probably be reached sometime within the next 100 years. The most probable result will be a sudden and uncontrollable decline in both population and industrial capacity. (Quoted in Meadows et al, 1992, p. xiii)

The decades since the 1960s have seen scientific indicators of environmental destruction and change, such as loss of biodiversity and climate change, heralded as proof that if humans continue on this track we will face a threat as a species. For example, the Millennium Ecosystem Assessment has strongly influenced environmental policy (Millennium Ecosystem Assessment, 2005). Its purpose was 'to assess the consequences of ecosystem change for human well-being and to establish the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems and their contributions to human well-being' (p. ii). The authors of this report argue that currently sixty percent of ecosystem services are being 'degraded' or 'used unsustainably' (Millennium Ecosystem Assessment, 2005).

Other significant responses to the idea of an environmental crisis have been international summits such as the United Nations Conference on the Human Environment (UNEP) held in Stockholm in 1972. This conference was attended by representatives of 114 countries. The environment was now on the global agenda. The 1970s saw increased concern for the environment and the human impact on it. Scientists were intensely involved in debating the issues. For example, the *Bulletin of the Atomic Scientists* included an edition (September 1972) dedicated to exploring what happened at Stockholm. In it, Berry (1972) claimed that Stockholm had been a success and had resulted in an 'awakening' to the fact that we live in only one world. The concept of one finite world with a 'carrying capacity' that needs to be considered is still a current theme in environmentalism and sustainability. The realisation of the potential for an ecological crisis was then, as it is now, a consideration for governmental policy.

Principle eighteen of the Stockholm declaration made the following assertion:

> Science and technology, as part of their contribution to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind. (United Nations Environment Programme, 1972, Principle 18)

Participants at the Stockholm conference regarded science and technology as essential to inform and validate political and economic policy regarding environmental concerns. Interestingly, they also saw science and technology as central to the environment's demise:

> In the long and tortuous evolution of the human race on this planet a stage has been reached when, through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless ways and on an unprecedented scale. (United Nations Environment Programme, 1972, Principle 1)

The covert recognition that the 'science' and 'technology' are to be valued not as a 'good' in and of themselves, but in the uses they are put to is an important insight that built on Carson's original perspective. However, this critique deflects an analysis of market capitalism as the underlying cause of the decay and destruction of the earth's ecosystems.

The Stockholm conference was instrumental in putting the discourse of 'sustainability' on the global agenda – although it had not yet gained the prominence in international policy that it has now. Carruthers (2005) argues that at this stage 'sustainability' was a 'comparatively marginalized, genuinely radical idea, carried out in practice by idealists in a handful of pockets of grassroots experimentation in remote corners of the rural Third World' (Carruthers, 2005, p. 288).

Throughout the 1970s there was continued ecological and economic decline, culminating in the Third World debt crisis in 1982 (Carruthers, 2005). It was becoming increasingly apparent during the 1970s that the modern cash economy and economic growth trajectory of the North was not 'viable for the South' (Carruthers, 2005, p. 286). The development process had gone 'tragically wrong' in the South, and millions of people were left marginalized and displaced from their lands and traditional livelihoods (Carruthers, 2005, p. 288),

The World Commission on Environment and Development (1987) attempted to examine the economic and ecological crisis. This was an independent commission set up by the United Nations General Assembly. One of its goals was to 're-examine the critical environmental and development issues and to formulate realistic proposals for dealing with them' (World Commission on Environment and Development, 1987). This resulted in the 1987 Brundtland Report entitled 'Our Common Future'. The commonality of our future as inhabitants of one planet represents a globalising discourse. As Dow (1992) argues, there are very important ways in which the consequences of environmental damage fall disproportionately on those in 'developing' countries. The Brundtland Report sought to solve these issues of inequity by arguing that sustainability required global economic development:

> Far from requiring the cessation of economic growth, it recognizes that the problems of poverty and underdevelopment cannot be solved unless we have a new era of growth in which developing countries play a large role and reap large benefits. (World Commission on Environment and Development, 1987)

The Brundtland Report outlined 'sustainable development' as that which 'seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future' (World Commission on Environment and Development, 1987).

The interpretations of scientifically grounded knowledge, such as those espoused by the biologists canvassed in this essay, are also central to the 1987 Brundtland definition of sustainability. For example it raises the concern that '[s]ome consume the Earth's resources at a rate that would leave little for future generations' and that 'Nature is bountiful, but it is also fragile and finely balanced. There are thresholds that cannot be crossed without endangering the basic integrity of the system' (World Commission on Environment and Development, 1987). Systems-thinking is an ecological way of understanding the world we live in.

Despite these international forums and the urgent need for remedial social action and a new plan of action, the sense of crisis persisted into the 1990s. In 1992 the Union of Concerned Scientists (see Union of Concerned Scientists, 2011) issued a strong warning:

> We the undersigned, senior members of the world's scientific community, hereby warn all humanity of what lies ahead. A great change in our stewardship of the Earth and the life on it is required, if vast human misery is to be avoided and our global home on this planet is not to be irretrievably mutilated. (Quoted in Union of Concerned Scientists, 2011, p. 2)

The 1990s also saw the publication of 'Caring for the Earth: a strategy for sustainable living' (IUCN/UNEP/WWF, 1991) – a revised and updated version of the World Conservation Strategy. This document argues for the necessity of changing attitudes and practices towards more sustainable forms of economic and social development. It has a strong focus on biology-centred knowledge as a basis for its argument about the need for sustainable development. The following quote from 'Caring for the Earth' justifies the centrality of 'nature' for our biological, social and economic well-being:

> Plants and animals, evolving over hundreds of millions of years, have made the planet fit for the forms of life we know today. They help maintain the chemical balance of the Earth, and stabilize climate. They protect watersheds and renew soil. (IUCN/UNEP/WWF, 1991)

The Club of Rome recently commissioned a new report called 'Factor Five –transforming the economy through 80% improvements in resource productivity', which attempts to outline a new economic paradigm based on green technologies. In the introduction to this report, Weizsäcker (Weizsäcker et al, 2011) indicates the extent of the crisis unfolding in the twenty-first century:

> The 21st Century will mark the time when the impact of [the world's] human inhabitants will have the potential to destroy its ability to support us. If the world we live on was three, or three hundred, times larger we would not be writing this book. The truth that the world is now rapidly coming to grips with is that we are damaging our planet to the point that it may not be able to maintain the conditions we have come to take for granted. (Weizsäcker et al, 2011, p. 1)

In part due to the environmental movement, consensus amongst those in the West is that the 'environment' is something 'out there' needing protection and conservation. This represents a dilemma for the interests of capital. The previous dominant post-World War II modes of progress and development, supported by what Blühdorn calls the 'pre-ecological' frame of mind, now lacked credibility (Blühdorn, 2007). Awareness of pressing environmental issues in the West has led to pessimism around both the state of the environment and the perception of being able to address environmental issues.

Broom (2011, p. 123) indicates the 'overwhelming sense of despair' that people can feel on learning of the conditions that face the environment and humanity. The scientisation of nature has provided the stage in which its ruin and possible collapse are objectified and explored. It has provided a 'truth model' as a platform for environmentalist concerns and increasingly a particular form of economic development – that of sustainable development (SD). Sustainable development, Blühdorn argues, is the new 'mantra' of advanced modern societies (Blühdorn, 2007). Carruthers (2005) argues that the understanding in the 1970s of 'sustainability' was soon to be transformed completely as a 'near-universal ordering principle for environmental and development policy across the world' (Carruthers, 2005, p. 289). Through the production of global documents such as 'Our Common Future' (World Commission on Environment and Development, 1987) and 'Agenda 21: Rio Declaration on Environment and Development' (UNCED, 1992), sustainability was transformed from a marginal counter-hegemonic radical movement into a platform for legitimating neoliberal universalising projects (Carruthers, 2005).

The Discourses of Science, Sustainability and Neoliberalism

Sustainable development has become 'arguably the dominant global discourse of ecological concern' (Dryzek, 2005, p. 145). In straddling the camps of economic development and ecological concern, SD purports to dissolve historical conflicts (Dryzek, 2005, p. 147). The project of sustainable development has been exemplified in key inter-governmental documents, including 'Our Common Future' and 'Agenda 21', both of which linked the environmental crisis with broader economic development concerns. The perceived dependence of economic development on the environment was prioritised in 'Our Common Future' as signalling the need for governments to change tack towards a 'sustainable future'. SD is now embedded in every domain of public policy. Few can argue with the broadly humanitarian and ecological goals this blueprint for global action envisions. However, as this article attempts to demonstrate, the SD movement underscores a neoliberal political agenda for global free-market expansion.

The SD discourse signifies the need for a universal shift in ethics and behaviours in order to develop economic practices and social lifestyles that will sustain the ecological life support systems of our planet (Dryzek, 2005). The SD discourse can be traced to a variety of ideological influences, political movements and writings, including those of the biologists and intergovernmental conferences discussed above. It melds these influences into a unifying whole, but eludes attempts to define what its concrete implications are (Blühdorn, 2007) It has the hallmarks of rhetoric – garnering support from key players through signalling its concern for the environment *and* economic development *and* social imperatives.

Sustainability is often seen to support a set of attributes that is broad enough to draw support from different factions. These include business groups, educationalists, environmentalists, political organisations (both governmental and non-governmental) and others (Dryzek, 2005, p. 145). The perception of common interests achieved by the discourse of sustainability may legitimate a conversation (which is on the surface benign) amongst these groups. However, while the discourse of sustainability binds diverse groups into a seemingly common conversation, it may also obscure the dominance of global neoliberal market interests. Current economic rationality is dominated by the neoliberal hallmarks of individualism, belief in free markets, privatisation and natural justice.

Hill claims that neoliberal policies 'have increased inequalities globally and nationally, diminished democratic accountability and stifled critical thought' (Hill, 2003, para. 1). Thus, the contention that SD is based on neoliberal politics may appear to be unclear, especially since advocates of sustainability argue for democratic participation and the elimination of social inequalities, and champion critical thought. However, this very perception of a chasm is part of the insidious nature of the neoliberal project. Irwin (2010) argues that it can be difficult to detect because of the pervasiveness of key ideologies (such as market ideology) that become 'common sense'.

Neoliberal policy is based on an economic theory that perceives individuals as rational agents who are self-interested. This assumption built on the work of John Stuart Mill in the mid-nineteenth century. Individual self-interest is taken as critical – 'homo economicus' acts as a rational utility-maximising agent and should be free to exercise choice and compete in markets (Larner, 2000). This is then said to maximise both social welfare and economic well-being. Neoliberal policy has been dominant in global economic policy for the last three decades (Dryzek, 2005, p. 122).

SD's link to neoliberal ideology was clearly articulated at the 'Earth Summit', or the United Nations Conference on Environment and Development (UNCED), in 1992 in Rio de Janeiro. This has been pivotal in marrying the idea of 'free trade' with environmental protection (Carruthers, 2005). It championed the idea of dynamic economic development and access to markets:

> The development process will not gather momentum if the global economy lacks dynamism and stability and is beset with uncertainties. Neither will it gather momentum if the developing countries are weighted down by external indebtedness, if development finance is inadequate, if barriers restrict access to markets and if commodity prices and the terms of trade of developing countries remain depressed. (UNCED, 1992)

Neoliberal policy can be found in what Irwin calls the 'market version' of sustainability, where threats to the ecological integrity of the planet are a matter to be addressed by 'innovation (new markets) and efficiency (reduced costs)'. The centrality of 'crisis' in sustainability discourse has performed an ideation function, motivating public support through fear (Irwin, 2010).

As we have seen, the assumption of a freely choosing, rational human being was evident in the work of Hardin (2005). He referred to humans as 'independent, rational, free enterprisers'. Hardin saw an issue with an exponentially increasing human population and finite natural resources and advocated avoidance of helping the poor so that the 'natural laws' can keep population in check. On the other hand, neoliberal discourse tends to favour 'substitutability', which refers to the assumption that human technological advancements and human capital will transcend the limits imposed by the environment.

Larner argues that the term 'neoliberalism' can be understood in a number of ways – relating variously to policy, ideology and governmentality (Larner, 2009). Neoliberalism is characterised by a shift from welfare Keynesianism to free markets unfettered by state intervention. Reforms attributed to the neoliberal agenda favour 'adherence to market based policy options' (Larner,

2009, p. 9). The emphasis on markets can be seen in the creation of new markets such as the Emissions Trading Scheme (ETS) (Irwin, 2010, p. 79). Neoliberalism involves the 'corporatization, commodification and privatisation' of what were considered public goods under a Keynesian model of economics (Harvey, 1974). In neoliberal terms this includes the environment, which is seen as a 'natural resource' and a 'source of inputs'.

SD has morphed to accommodate key neoliberal assumptions. Irwin (2010, p. 77) argues that sustainability purports to be 'after' neoliberalism, critiquing some of the tenets of neoliberalism such as 'too great an emphasis on rational individualism'. However, as Irwin (2010) notes, the ideology of the market is already 'built into' the discourse of sustainability. Market ideology is central to the discourse of neoliberalism and has come to be seen as 'natural' or 'common sense'. Thus, the hegemonic influence of market ideology means that its pervasive influence may be less detectable. As Birchfeild argues:

> Market logic is applied to more and more areas of human life, as is the case with neoliberal
> globalization, and what essentially results is an increasing sublimation of politics ... The
> dominant assumption that human nature and behaviour can be characterized as economizing,
> maximizing utility to secure self-interest, gains acceptance as an inviolable truth. (Birchfield,
> 1999)

The potentially liberating and critical ideas embedded in 'sustainability' (such as concern for ecological health and social justice) and transferred to the level of social policy are valuable. However, the dilemma is that they have gained mainstream acceptance within the context of neoliberal hegemonic logic. Irwin (2010) notes that the egalitarian values underpinning the development of 'sustainability' – such as intergenerational equity – have morphed into neoliberal translations. Neoliberalism is a 'form of market ideology' 'that is inherently antithetical to democratic principles' (Birchfield, 1999). Irwin (2010) argues that 'sustainability-as-neo-liberalism' is counter to its radical roots in the green movement. In many ways, the present article attempts to demonstrate that while 'sustainability-as-neo-liberalism' may be counter to some of the philosophical and political tenets of the green movement (especially those of deep ecology), in many respects there are many continuities.

Discussion and Conclusion

Foucault considered that discourses in society are 'multiple, overlapping and often conflicting' (Castree, 2005, p. 146). This analysis has attempted to demonstrate how discourses of the environmental crisis have evolved in relation to particular political and economic interests. Discourse can have a conservative function in society by shaping our understandings of everyday reality in ways that become commonsensical. For example the 'naturalistic discourse of poverty' can make sense to people who consider the rise of free-market capitalism to be a result of rational humans acting in a self-interested way.

Through using Foucault's genealogical history strategy I have attempted to point to key continuities and mutations in thought that indicate shifts in worldviews. As a 'model of truth', hailed as neutral and value-free, the science of ecology lent its credibility to environmentalist concerns. The positivist assumptions underpinning scientific ecology and the conservative politics of population biologists, however, reveal a value-laden discourse that has contradicted the radical and disruptive tenets of deep ecology. On one level, this interpretation has tried to show how the science of ecology has tried to secure the philosophical assumptions of environmentalism 'within its bounds' (McHoul & Grace, 1998, p. 23).

By constructing a universalising mindset to resolve tensions between the interests of capital and those of environmentalists, the discourse of SD has attempted to avert a legitimation crisis of capitalism. The acquiescence of the public to environmental concerns is due in large measure to the early work of writers such as Carson. In this article I have examined how the ecological ideas as represented by Carson and other biologists are central to environmentalist discourse. These include a focus on systems, and on interdependence and balance in nature and between the human and non-human world. Ecological thinking is a radical counter to dominant frames of mind which define nature as separate from humans. However, it has an uncertain positioning in the scientific field which has hitherto seen humans fragmented from nature. Ecology itself may not have dealt

adequately with this rupture on a philosophical level. As 'science', it is open to critiques such as that of Wilshire, who claims: 'In a real sense, it finds no room for us as integral beings in an integral world, for as it grasps us it splits us into minds and bodies' (Wilshire, 1990).

A number of ideas that are currently central to sustainability have been drawn from the works of biologists in the 1960s and 1970s. The rich eco-centric understandings evident in the work of Carson in particular are lost in the neoliberal version of sustainability. The concepts Carson brought to public awareness such as 'nature as a complex ecosystem' have been co-opted into the neoliberal version which predominantly considers nature in terms of a 'resource'. Irwin argues that neoliberalism can be seen to impoverish 'environmental morality and politics' (Irwin, 2010, p. 72). Certainly an environmental morality that sees humans as embedded in the natural world, dependent on each other and shaped by our collective existence, is an important insight. These insights are potentially disruptive to the dominant ideologies that support economic growth.

Neoliberal versions of sustainability involve the 'the greening of capitalism'. This takes the form of 'superefficient architecture and transportation systems, as well as biomimicry and service leasing' (Rogers, 2010, p. 6). The creation of eco-friendly products through innovative methods and new technologies means new markets, and increased efficiency reduces costs (Irwin, 2010, p. 21). However, as Rogers (2010) points out, the increase in profits goes back into the business, fostering economic growth. Irwin (2010) argues that in the neoliberal versions of sustainability, the market is the bottom line. When the environment is only important in relation to markets and economic growth, it is valued for particular reasons.

In SD, the concept of 'growth' is replaced by 'development', signifying egalitarian intentions. However, with the neoliberal 'management and manipulation' of the current ecological crisis to generate Third World debt, privatisation schemes will only deepen poverty and environmental destruction (Harvey, 2005). Blühdorn argues convincingly that key features of late-modern societies are simply 'unsustainable', and that sustainability has become a contradictory discourse (Blühdorn, 2007). He argues that the field of eco-politics has made substantial advances, but has failed to address the underlying causes of environmental destruction (Blühdorn, 2007). Harvey (2005) puts the danger of continuing on the course of environmental devastation in the neoliberal era succinctly. He writes:

> The era of neoliberalization also happens to be the era of the fastest mass extinction of species in the Earth's recent history. If we are entering the danger zone of so transforming the global environment, particularly its climate, as to make the earth unfit for human habitation, then further embrace of the neoliberal ethic and of the neoliberalizing practices will surely prove nothing short of deadly. (Harvey, 1974)

The promise of deep ecological thought as a discourse that provides a level of radical interruption from the dominant anthropocentric assumption of the West is questionable. According to Hay (2002), deep ecology is both a movement and a philosophy. At its base, he argues, there is a moral individualism that is consistent with western philosophical traditions, perhaps enabling its co-option into dominant discourses such as sustainability (Hay, 2002).

Another dilemma for environmentalism is the centrality of science in providing a platform for justifying its inclusion in policy and practice. There are tensions in the broad acceptance of science and environmentalism that should not be ignored. First, science is limited in its applicability to social change because of its inability to establish ethical and moral considerations. As Wilshire (1990) notes, 'science is considered the paramount way of ... knowing ... [however,] it cannot establish what nearly everyone assumes: that it itself is good'.

Deep ecology has struggled to take hold as a movement (Hay, 2002), While its key insights have been harnessed for political gain, environmentalism has gained the strongest ground when it has stressed 'survivalist' concerns within a language of 'scientific truth' and crisis (Dryzek, 2005). Embedded in much environmentalist discourse is a concern for urgent action to be taken to mitigate against the destructive effects of humans on the environment before it becomes unfit for human habitation. Mueller has explored how the discourse of ecological crisis has fed into the presumption of the need to 'scientifically [prove] that a crisis exists' (Mueller, 2009, p. 1031). Likewise, Oreskes argues that the domain of environmental policy is dependent on scientific 'truth' claims to justify demands for government intervention (Oreskes, 2004). Increasingly, scientific

proof of an ecological crisis is being accepted as a moral imperative and motive for the '"greening" of the individual, corporations, and society' (Mueller, 2009, p. 1032).

As Oreskes (2004) notes, however, basing political change on the onus of scientific proof leaves it open to a backlash. For one thing, there is the possibility that scientific 'evidence' of environmental decline may be challenged – as, for example, Bjørn Lomborg (2001) has done in *The Skeptical Environmentalist*. Lomborg, a statistician, points to selective use of material by scientists in the creation of what he considers an environmental crisis that is based 'more on myth than on truth' (Lomborg, 2001, p. 32). As Oreskes claims, the scientific community has historically been divided about a range of environmental issues. The important point he makes is that '[i]n all but the most trivial cases, science does not produce logical indisputable truths about the world' (Oreskes, 2004, p. 369). Placing the burden of proof on the scientific community is at best a 'misunderstanding ... of the role that science could ever play in policy' (Oreskes, 2004, p. 369).

Furthermore constraining policy change by requiring it to have the backing of 'scientific proof' tends to obscure ideological and political motives. For example, 'survivalist discourse' from the 1970s based on 'carrying capacity' and 'limits to growth' is essentially utilitarian and homocentric – completely at odds with some of the stated premises of deep ecology (Dryzek, 2005; Merchant, 2005). Deep ecology has been critiqued for its lack of political analysis (Merchant, 2005). It has displayed a political naivety in its attempts to criticise cultural worldviews (such as the domination of nature) as being unrelated to wider political struggles (Merchant, 2005).

The philosophical, political and economic discourses embedded in environmentalist and sustainability movements are revealing. The arguments concerning environmental degradation are co-opted by dominant modernist rationality, deflecting attention away from the capitalist mode of production itself and ascribing it to causes such as over-population and over-consumption. This historical discourse analysis has attempted to reveal a political conservatism embedded in environmental discourses that justify and further the interests of capital.

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