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A Political Sociology of Socionatures: Revisionist Manoeuvres in Environmental Sociology

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ABSTRACT *Grow or die/treadmill of production (GOD/TOP) discourses have played a valuable role in insisting that the antagonism between capitalist political economy and ecology should be a central concern of environmental sociology. However, this article raises questions as to the extent to which emphatic versions of this argument are sufficiently subtle for grasping what is at stake in the current environmental debate. In neo-liberal times, 'Nature' may well be made and remade as a commodity as ever before. However, a range of developments from the sociology of environmental science to the rise of non-equilibrium ecology, critical political ecology to the desire to develop post-naturalistic agential and cultural materialisms in human geography and science and technology studies all point to considerable complexities in unravelling winners and losers in this process. Engagement with the uneven spread, revisions, reversals and pathologies of ecological modernisation introduces further points of uncertainty into the discussion. It is suggested that such developments point first to the hazards of polemically foreclosing debate about the relationship between capitalist political economy and ecology. Second, these developments also suggest that more fluid and open engagements in the environmental social sciences will be required to map the power geometries that flow through the production, en-framing, enclosing and degrading of twenty-first century socionatures and technonatures.*

Introduction

The notion that the accumulation process of capital is characterised by a 'grow or die' (GOD) or 'treadmill of production' (TOP) dynamic which both generates and explains 'global environmental crisis' has provided critical currents of environmental sociology (and related forms of green social and political theory) with a powerful explanatory theory to counterpose to neo-Malthusian environmentalism over the last four decades. This article

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begins by mapping the genealogy of this debate. I then go on to question the extent to which 'emphatic' versions of this argument provide a sufficiently subtle grasp of the material and semiotic complexities and power relations that run through the contemporary socio-environmental debate.

Attention is paid to three recent bodies of literature: notably: (a) the sociology of environmental science, critical political ecology/new ecology, (b) production of nature and hybridity narratives and (c) the rise of more qualified versions of the ecological modernisation thesis. I suggest all these literatures (in marked contrast to emphatic GOD/TOP narratives) point increasingly to the messy complexities surrounding the contemporary environmental debate and the capital/ecology relationship.

Following this, I conclude by arguing that what this suggests is the need for a degree of reflection and revision in critical currents of environmental sociology and green social theory more generally. More finely grained engagements will be required to map the power geometries flowing through the production, en-framing, enclosing and degrading of twenty-first century socio/techno natures.

Grow or Die, Treadmills and Capitalism: the Intellectual Genealogy of a Modern (Radical) Orthodoxy

It is now widely recognised that critical sociology was slow to engage with the wave of environmental concern that began to sweep 'the west' from the 1960s onwards. The overwhelming influence of Marxism with its Promethean and productivistic orientation, and its (valuable) historical sensitivity to the racialised and class-based logics of Malthusianism ensured declarations of a looming 'global environmental crisis' emerging from population biology (Ehrlich, 1970), deep green survivalism (Goldsmith, 1972) or systems dynamics computer modelling (Meadows, Meadows, Randers and Behrens, 1972) were widely treated with suspicion. Beyond initial charges that environmentalism was primarily a preoccupation of the middle classes, considerable support was also shown in critical sociological circles for scholars that questioned the empirical basis of the *Limits to Growth* report and the methodological robustness of the modelling on which much of this exercise in futurology was based (Cole, Freeman, Jahoda and Pavitt, 1973). A good deal of scrutiny was given to the essentially Malthusian theoretical assumptions underpinning this work (e.g. technological pessimism and natural limits ideologies; Harvey, 1974). Further concerns were raised with the manner in which 'limits' and 'no growth' orientated discourses appeared to be insensitive to the dispossessed 'at home' or the material aspirations of the developing world (Benton, 1996).

For a more marginal group of critical social theorists, however, more variously influenced by Critical Theory, post-industrial thought and feminism, as well as Weberian-tinged Marxisms (Bookchin, 1965b, 1971; Commoner, 1971; Leiss, 1972; Gorz, 1975; Stretton, 1976; Schnaiberg, 1980) neither the failings of neo-Malthusian discourses nor the lack of a self-evident class

politics of the environment exhausted the importance of addressing ecological questions or engaging with the radical philosophical and ethical challenges generated by environmentalism. Rather, it was maintained that what was required was an internal critique of both the Malthusianism and liberal reformist moments that underpinned environmentalism.

Emerging advocates of what could be called 'social environmentalism' could be distinguished from dominant currents of neo-Malthusian environmentalism in three ways. First, in terms of the *diagnosing* of the make-up of 'the modern crisis', Bookchin (1962, 1965b), Commoner (1971), Harvey (1974), Enzenberger (1974) and Schnaiberg (1980) all decisively rejected the notion that environmental questions could be framed around the population/resources dualism and raised reservations more generally about 'scarcity/limits' discourses. What was taken more seriously was a much more carefully defined environmental crisis of the natural world, produced through ecological simplification, urban pollution, the spread of civilian and military nuclear technology and the rise of chemical intensive agriculture (Bookchin, 1962, 1965b, 1971; Commoner, 1971; Schnaiberg, 1980). Bookchin and Gorz additionally stressed an emerging eco-social crisis in the postwar built environment produced by runaway urban sprawl, the decline of the city, public space and the civic environment (Bookchin, 1965a, 1973) and a crisis in the work environment, as post industrial modes unsettled more traditional identities (Gorz, 1975).

Secondly, in attributing *responsibility* for this state of affairs, in contrast to the rhetoric of undifferentiated universal responsibility favoured by neo-Malthusians, social environmentalism insisted on differentiated social and cultural analysis. Unlike emerging currents of 'radical ecologism' or liberal environmentalism, it was not the generalised object of 'human beings', 'industrial society', 'population' or 'anthropocentricism' in themselves that was seen as credibly informing socio-ecological analysis. Rather, social environmentalists argued that a credible understanding of environmental degradation needed to move beyond moralistic and methodological individualist approaches to view human behaviour and motives as differentially situated and embedded in relations of power (class, race, gender, institutional access, etc.). This required socio-ecological analysis to attend to the complex interplay between agency, institutional/economic structures and ideologies but be embedded further in a *political economy of the environment* which paid explicit attention to the environmentally hazardous results of specifically capitalist forms of organisation of economic life.

Finally, while the critique of existing forms of technological development was central to social environmentalism, at the same time one can find a general technological optimism about the possibility of redirecting technological and productive systems towards more ecologically benign ends. Bookchin, Commoner, Gorz and, to a lesser degree, Schnaiberg all rejected the technophobia that gripped certain deep green currents and to varying degrees viewed new 'eco-technologies' and industrial systems as playing a central role in any future ecological settlement.

Despite these points of convergence, however, one can also find that tensions and differences emerge between 'cautious' and 'emphatic' proponents of GOD/TOP arguments.

More cautious currents placed emphasis on ecological uncertainty and the need to engage critically and selectively with sweeping 'global ecological crisis' narratives. Such currents continued to flag the dangers of environmental determinism and entertained the possibility that existing institutional and economic forms might resolve environmental problems.

For example, Enzenberger (1974) suggested that not only was there a need to exercise a good deal of caution in embracing certain class laden 'orthodox' environmental narratives, but that environmental problems potentially constituted both a *threat* and an *opportunity* to capital. Thus, he argued, as environmental costs of production were off-loaded on to the state and the public, new capitalist opportunities would be created by profitable investment environmental repair potentially giving rise to what he referred to as an emerging 'eco-industrial complex' (Enzenberger, 1974). Schnaiberg's *The Environment* (1980), which reworked GOD arguments in terms of a 'treadmill of production' discourse, similarly emphasised 'the critical uncertainty' (Schnaiberg, 1980: 41) surrounding many evaluations of the scale of environmental problems and entertained a range of diverse scenarios and alternatives through which the treadmill might be brought under control. André Gorz argued in *Ecology as Politics* that capitalism, might 'assimilate ecological necessities as technical constraints and adapt the conditions of exploitation to them' (Gorz, 1975).

In contrast, emphatic 'crisis-orientated' theorists (e.g. Bookchin, 1980, 1990; Bahro, 1982) completely rejected such arguments. Bookchin, for example, argued a central weakness of Gorz's *Ecology as Politics* was a basic failure to recognise that:

> If any serious ecological conclusion is to be drawn from *Capital* Vol. I, it is from Marx's compelling demonstration that the very law of life of capitalist competition, of the fully developed market economy, is based on the maxim, 'grow or die'. Translated into ecological terms, this clearly means that a fully developed market economy must unrelentingly exploit nature . . . (Bookchin, 1980: 293)

Now, it is of interest to turn here to consider the direction of the 'second wave' debate of TOP/GOD arguments that unfolded from the late 1980s onwards. Following in the wake of the Brundtland report in 1987 and the expansion of global environmentalism towards sustainable development agendas, we saw a renewed interest in 'grow or die'/treadmill theories. We can point to O'Connor's (1998) theorisation of a 'second contradiction of capitalism' between the forces, relations and conditions of production; Foster's (1992, 1998, 1999) recovery of Marx's theory of 'metabolic rift'; Foutopolous' (1997) development of Bookchin's crisis theory; the revival of the treadmill school

(Gould *et al.*, 1996, 2003); and additional contributions by emerging social ecofeminists to GOD debates (Mellor, 1992; Salleh 1997).

Such currents have been consolidated far more successfully in the emerging subdiscipline of environmental sociology. We have seen mainstream currents of critical social theory/sociology, which previously had little interest in the environment, entertain essentially generic GOD/TOP arguments (e.g. Wallerstein, 1997; Hardt & Negri, 2001) indeed, generic GOD/TOP arguments have come to significantly inform the thinking of anti-globalisation currents.

However, it would also seem to be the case that with some notable exceptions (Benton, 1994; Harvey, 1996, 1998) there has been a much stronger tendency in 'second-wave thinkers' to take debates in environmental science as reasonably self-evidently supporting linear, generalised global crisis theory. Thus, whether we consider Foster's assertion of the 'Absolute general law of environmental degradation under capitalism' (Foster, 1992), Kovel's (2002) assertion that ecological crisis suggests we must either face the end of capitalism or the end of the world, the shift of the 'treadmill of production school' from advocacy of something essentially resembling green social democracy (Schnaiberg, 1980) to more recent shifts towards advocating in essence a no-growth steady-state economy (Gould *et al.*, 2003), the assertion by Wallerstein that environmental crisis is the final crisis that presents capital with 'no exit' (Wallerstein, 1997), the response of some of the most influential articulations of second-wave positions has been to cast the debate in increasingly 'emphatic terms'. A growing literature emerging elsewhere in the environmental social sciences, however, suggests that the environmental debate has evolved in a far less straightforward way over the last decade.[1]

From Generalised Crisis Theory to Differentiated Complexity?

The challenge to undifferentiated 'global eco-crisis theory' has come from numerous quarters over the last decade. One source of this challenge, certainly, has been a corporate 'brown' or 'greenlash' (Rowell, 1996; White *et al.*, 2006) that from the late 1980s began to grow in strength and numbers. The key role played by companies such as Exxon Mobil and other 'front organisations' in mobilising, funding and supporting dissident sceptical climatologists, organisations such as the 'global climate change coalition' (Ehrlich & Ehrlich, 1998) and the rise of ecosceptic New Right think-tanks, is now well documented (Beder, 1997; McCright & Dunlap, 2004). However, it is also increasingly clear, as Harvey (1996, 1998) has argued, that the problematisation of generalised and linear 'global ecocrisis' narratives within the social and natural sciences cannot simply be explained away solely via reference to such developments.

For example, from the early 1990s, Fred Buttel, Peter Taylor and their various collaborators (see Buttel, Hawkens and Power, 1990; Buttel & Taylor, 1994, Taylor, 1997; Buttel, 1998; 2003) provided one of the earliest 'cautionary tones' on the adoption of undifferentiated crisis rhetoric in environmental sociology. Seeking to remind environmental sociologists that the relationship

between science and politics cannot be simply seen as politics being stimulated by scientific findings but rather that 'politics is woven into the fabric of science' (Taylor, 1997), through a series of detailed and richly developed case studies on climate change, the population issue and biodiversity, concerns were flagged with the manner in which 'eco-crisis narratives' obscure complexities, different social framings and power relations expressed within global environmental science (Buttel *et al.*, 1990). Concerns were flagged of tendencies towards environmental determinism in the science of global warming where 'the physics and chemistry of climate change set the parameters for environmental and biological change' (Taylor, 1997), thereby in turn reinforcing technocratic forms of politics. Important concerns were also raised with the continual influence of Malthusian thinking on global environmental science (Taylor & García-Barrios, 1995) and tendencies of environmental sociologists to ignore the high degrees of uncertainty underlying the general circulation models used by climate scientists (Buttel & Taylor, 1994). This work, therefore, by no means seeking to undermine environmental concerns, warned against environmental sociologists relying on popular accounts of environmental problems and 'stylised facts' to achieve premature closure on the dimensions of environmental change (Buttel & Taylor, 1994). Recent debates occurring in scientific and political ecology have indeed reinforce this attention to complexity, uncertainty, power relations and the opened-ended nature of much debate occurring in the environmental sciences.

For example, continued disputes within the science of ecology have provided further examples of the complexities and uncertainties which can be found running through the global environmental debate. Much emphatic GOD/TOP theory (like environmentalist discourses more generally) has been informed by a reading of scientific ecology common in the 1950s and 1960s. What Boucher (1998) refers to as 'Newtonian ecology' generally assumed that ecosystems could be characterised by gradual transitions, homeostasis and at some level 'a balance of nature'. As numerous commentators have noted, over recent decades (Botkin, 1990; Zimmerer, 1994), such an emphasis on equilibrium, balance and order has increasingly given way in scientific ecology towards a stress on the disequilibria, instability and even chaotic fluctuations which are now seen as more adequately characterising biophysical environments.

What is increasingly referred to as 'non-equilibrium' or 'stochastic' ecology (Zimmerer, 1994, 2000; Botkin, 1990; Scoones, 1999) contrasts with past currents in a number of ways. Most notably, moving away from 'balance of nature' ideas much greater attention has been given to the central role that flux plays within ecosystems and the extent to which many ecosystems are highly dependent on natural disturbances to reproduce themselves. As Richard Leakey and Roger Lewin neatly summarise: 'Ecological communities do not exist in a benign harmony, but instead are shaped by many forces, some chaotic, some random. Above all there is constant dynamic change' (Leakey and Lewins, 1994:178). On the related notion that diversity enhances ecosystem stability (a theme which underpins many assumptions of 'radical ecologism'),

the work of Robert May (1973) is cited widely as demonstrating that such claims need to be stated with more care because, as Haila and Levins note: '... feedback loops within a system may be stabilising or destabilizing, depending on the structure of the system as a whole' (Haila & Levins, 1990 but see also Boucher, 1998: 511). Similar problems have also been raised over traditional ideas of ecological succession moving towards climax (Zimmerer, 1994) and even the notion of *inter-relatedness* – often presented as a *defining* feature of a holistic ecological outlook in many radical ecological discourses receives a distinctly qualified emphasis (Haila & Levins, 1990).

It is now recognised increasingly in some circles that these developments in scientific ecology introduce significant complexities into debates about biodiversity, deforestation, appropriate strategies for land and resources management and so on (see Botkin, 1990; Boucher, 1998; Zimmerer, 2000; Forsyth, 2003). Botkin's work, for example, has highlighted the extent to which non-equilibrium or 'new' ecology has considerably opened up the field of debate about what exactly constitutes environment degradation. Modern scientific ecology with its emphasis on the *flux of nature* suggests less that there are 'lessons from nature' or limits in nature but poses the question: out of the diverse dynamic states that ecosystems can take, what kind of nature do we want? Much contemporary GOD/TOP theory in environmental sociology, alongside much environmental campaigning (Boucher 1998: 513; Scoones, 1999:479; Zimmerer, 2000, 2004) has been oblivious to these changing debates.

In geography and development studies, and most notably in political ecology/critical political ecology though the insights of non-equilibrium ecology drawn together with environmental history, historical and ecological anthropology and post-colonial theory have had a profound effect on the field. The result has been a body of work grounded in detailed case studies which argue increasingly for a more cautious attitude to the macro generalisations of absolute environmental decline which are seen as characteristic of the discourses of international agencies and of mainstream policy makers.

Research by Leach and Mearns (1996) and Fairhead and Leach (1998), for example, have all brought into question UN estimates of the scale of desertification in Africa. Fairhead and Leach (1998) note that dominant theories of desertification in West Africa maintained population pressures forced peasants to expand onto marginal lands, leading to overgrazing, fragile soils and deforestation. While such narratives lead certain state agencies and international organisations to support coercive conservation strategies, their own analysis of historical surveys, aerial photography and other sources found that not only had desertification been overestimated, but growing numbers of local people had been cultivating more forestry, not less. Blackie and Brookfield (1987) argued, in relation to soil erosion, that generalised crisis narratives frequently obscure interpretive complexities in mapping these processes: one farmer's soil erosion can provide another farmer's soil fertility. Forsyth (1998) has tracked the decline of Himalayan environmental degradation theory in the mid-1980s – where it was found that the assumption of rapid

deforestation occurring in this area was simply inaccurate (being premised on faulty neo-Malthusian premises) and underestimating normally high rates of soil movement under monsoon rainfall. Many more studies in political ecology have pointed out that numerous studies of environmental change in sub-Saharan Africa have been premised on records made by colonial park rangers, who have tended to romanticise the state of the African landscape prior to European settlement and underestimate the adaptive practices of people living in drylands (see Leach and Mearns, 1996; Blackie in Castree and Braun, 2003).

Critical political ecology is not without problems. For example, rather more energy has been spent picking apart 'orthodox' framings of environmental problems emerging from institutions such as the World Bank and the International Monetary Fund (IMF). Rather less attention thus far has been given to the equally problematic framings and ideological assumptions embedded within contrarian narratives. The micro and case-study nature of many of these studies is something of a mismatch with global environmental discourses. However, a close reading of this literature does generate a much greater appreciation of the complexities involved in understanding and defining environmental degradation. As, Forsyth's survey of the field notes: 'It is important to reiterate that these discussions . . . do not deny the importance of environmental degradation, but illustrate the inadequacy of the concepts we use to define it' (Forsyth, 2003: 36).

The present non-engagement between critical political ecology and GOD/TOP currents in environmental sociology creates numerous ironies and perplexities. Many of the recommendations that have emerged from recent work in political ecology or indeed Buttel and Taylor's research, such as the stress on the importance of differentiated critique, viewing environmental problems in terms of socio-ecological processes, rejecting methodological individualism, recognising the heterogeneous impact that humans have on their environment and bringing political economy, cultural and historical analysis and analysis of the state into modes of socio-ecological explanation, are potentially compatible with 'reflexive' versions of social ecology, ecological Marxism and the treadmill of production tradition in environmental sociology. However, stark differences remain. Notably, for TOP/GOD theorists macro crisis theory in global environmental science tends to be read uncritically, as it confirms the treadmill analysis and indeed the underlying critique of capitalism that informs this analysis. From the perspective of many critical political ecologists conducting concrete applied research in the Global South, however, it is uncritical readings of macro environmental crisis theories that are increasingly the object of concern. Part of the central problem, as Forsyth (2003) notes, is that many macro generalisations of environmental crisis can fail to capture biophysical uncertainties, underestimate historical complexities in defining environmental change, the adaptive practises that local people have had towards their environment as well as the different values that different societies and social groups bring to bear in understanding what constitutes an environmental problem.

Grow or Die in Post Naturalistic Times: Hybridity, Cyborgs and The Environmental Sociology of Socionatures

A second and related set of debates that generate further challenges for emphatic TOP/GOD discourses emerge from ongoing ontological and epistemological debates occurring in the environmental social sciences. While most GOD/TOP theorists are critical of the simplicities of neo-Malthusian environmentalism, they are nevertheless underpinned by an underlying naturalistic/realist understanding of materialism/nature and related ontological commitments to strong society/nature dualisms. This desire to foreground the materiality of the entities we call 'nature' has certainly been important in drawing a line against the undertheorisation of nature in the social sciences and sociology (Benton, 1994) and problematic tendencies towards super idealism underlying some extreme social constructionist currents. However, growing currents of eco-Marxisms in the production of nature tradition (Smith, 1984; Castree, 1995, 2002; Swyngedowu 1996), alongside actor network and hybridity theorists (Haraway, 1991; Latour, 1993; Whatmore, 2003), have argued equally that such naturalistic and dualistic theories also have their cost, potentially locking eco-social analysis into a worldview which is 'ontologically, theoretically and politically disabling' (Castree, 2000: 7).

For example, Castree (2002), Harvey (1996) and Sandler (1994) have all observed of O'Connor's influential work (1998) that, while he seeks to conceptualise the natural world in terms of the conditions of production, there is nevertheless a tendency in his mode of materialism to slip back into talking of 'two domains organised on very different principles' (Castree, 2002: 125), affirming at root 'the irreducible autonomy of nature' (O'Connor, 1998: 4). Such tendencies are even more pronounced in Schnaiberg's work on the treadmill, which is framed explicitly around the contradictory and antagonist logics which can be found between two distinctly different systems (see Schnaiberg, 1980: 18–9). Nature is conceptualised as singular, external and possessing 'natural limits'.

Various problems emerge from analyses organised on such ontological premises. First, this can ensure that some formulations of second wave GOD/TOP arguments converge with eco-romantic and neo-Malthusian discourses in underplaying the historical, cultural and dynamic nature of socio-ecological metabolisms (Harvey, 1996). Both O'Connor and Schnaiberg's work, of course, demonstrates an appreciation of the extent to which human societies have 'impacted' historically on their environment. What is undeveloped, however, to borrow from Neil Smith (1984), is a full appreciation of the extent to which human societies have long been involved in the dynamic production of various dynamic natures. The desire to focus on 'two systems' does not allow fully for the incorporation of Smith's (1984) provocative view that our contemporary nature(s) are produced within and are part of the sphere of capitalist production; that we are dealing effectively

with a world which, for all intensive purposes, now is marked by various and multiple 'created ecosystems' (Harvey, 1996) or 'socionatures' (Swyngedouw, 1996, 2004).

Now, we have to be clear that 'socionatures' are not the flat, two-dimensional, infinitely pliable surfaces of social constructionism. On the contrary, as historical (geographical) materialists, all these thinkers are keen to stress that socionatures possess causal powers, are consequential and efficacious. As Castree notes: 'nature may well be ''produced'' but produced nature in turn, cannot be exploited indefinitely: it has a materiality which cannot be ignored' (Castree, 1995; 2000: 29). However, these relational, processes and agential materialists insist that the limits an environment offers at any one moment in time has to be weighed-up with the series of 'affordances' it also allows for alternative courses of action. As such, the limits of socionatures can only be defined relative to the specific political, economic, technological and cultural relations they are bound up with (Harvey, 1974, 1996; Benton, 1994 Castree, 2000).

Second, environmental sociologies premised on sharp commitment to society–nature dualisms make it very difficult for such theories to engage with the proliferation of hybrid objects, actants and 'cyborgs forms' that Haraway (1991) and Latour (1993) argue increasingly litter the world we inhabit. That is, whether we consider fields of GM corn, Dolly the sheep, carefully 'restored' ecological habitats, the rise of 'cyborg' implants in humans, cloning or stem cell research, we seem to be embedded increasingly in and dealing with various 'socionatures' but also increasingly various 'technonatures' (see White and Wilbert, 2006). Beyond denunciatory rhetorics, dualist GOD/TOP arguments seem poorly equipped to deal with the dilemmas and possibilities of a situation, whereas Haraway (1991) argues that our sensuous embodied engagement with the world is marked increasingly by collisions between the organic and synthetic or, indeed, Mackenzie Wark's broader claim that we are seeing a world unfold where the 'second nature' of cities, roads and harbours, of skyscrapers, gardens and neatly preserved 'wilderness' national parks, is being progressively overlaid with a twenty-first century 'third nature' of information flows and hybridities, of informational ecologies seeping through older territories and ensuring that the natural, the social and the technical become progressively entangled (Wark quoted in Smith, 1996).

Third, it seems increasingly apparent that environmental sociologies premised on dualistic materialisms can underplay how representations of our contemporary socio/technonatures are themselves 'inevitably caught in a weave of symbolic and discursive meanings' and one might add power relations (Swyngedouw, 1996). Environmental sociologies that as first order commitments examine what a 'singular society' is doing to a 'singular nature' can obscure the multiple but nevertheless material natures that different social groups value, produce and reproduce at different spatial scales and the political consequences that follow from this. Approaches

in environmental sociology which work primarily through a 'grow or die/treadmill' materialist lens without supplementing this with a culturalist moment thus can end up simply ignoring vital questions of whose 'nature' is being 'saved' in environmental campaigning and the increasingly problematic issues of eco-orientalism, 'green governmentality' (see Darier, 1999) and coercive conservation (Peluso, 1993; Schroeder & Neumann, 1995). For example, 'treadmill' discourses that focus on the growing throughput of materials generated by the treadmill (e.g. York & Rosa, 2003) while ignoring literatures in political ecology and post-colonial studies can end up simplifying the problem definition stage of environmental questions and avoid dealing with the central political ecology question: for whom is an increase in materials a problem?

As such, it could be observed if we contrast the recent work of Smith, Harvey and Castree with Schnaiberg and his colleagues, these ontological differences result in subtle but rather important differences in their attitudes to the capitalist production of nature, and indeed to the whole direction of critical research in the environmental social sciences. Schnaiberg and his colleagues seek to understand the relationship between capital and the environment in terms of measuring overall 'additions' and 'withdrawals'. Because this activity is framed within a natural limits discourse, an increase of capitalist production is problematic *per se* and the only solution to this is to embrace a 'no growth' agenda. In contrast, the production of nature school seeks to map how nature and capital co-constitute one another in temporal and geographically varied ways (Castree, 2000:28). What this leads to is a very different view; notably, to quote Smith in an age of biotech, Dolly the Sheep and the human genome project: 'Nature more generally is far more malleable than it ever was...' (Smith, 1998:272). The concern here, to quote Harvey, is to grapple with the fact that we are always dealing with 'created ecosystems which 'both in substantiate and reflect...[capitalism]...in contradictory ways' (Castree, 2000:29). What this leads to, then, in production of nature discourses is a subtle critical theory which is marked by considerable irritation with the attempt to develop sweeping 'plenary' claims (Castree, 2000:28) or undifferentiated crisis constructions of the outcomes of the capitalist production of nature. To cite Castree:

> In a world where capital commodifies everything from Trees in Clayoquot Sound to wildlife in the Okavango to human bodies in medical clinics, it is simply wrong to argue that capital is wholly 'anti-ecological', or wholly able to exploit nature without limit....The capitalist production of natures – which strictly we need to talk of in the plural – therefore means that in particular times and places in relation to particular environments capitalism is ecologically harmful whereas in others nature is produced in ways that have positive social and ecological effects...'It all' as they say 'depends'. (Castree, 2000: 30)

Functionalism and Reductionism in the Theorisation of Capital/State/Ecology Relations

Such thoughts on the manner in which 'nature' remains insufficiently unpacked in emphatic GOD/TOP arguments also suggests that the broader understanding of the relationship between economics and politics equally needs to be unpacked. In an important but oddly ignored paper, Blair Sandler (1994) has argued that part of the problem we have here is that emphatic GOD/TOP discourses are based ultimately on an essentialist and teleological understanding of the dynamics and trajectory of capitalism. As Sandler observes of O'Connor's work, 'the logic of capital is not itself constituted by the context in which it exists but generated by the internal necessity of economics, 'pre-constituted' prior to immersion in any context (Sandler, 1994:39–40). Putting this in more simplistic terms, notable tendencies exist in emphatic GOD/TOP arguments to attribute essential elements to capitalism, markets, economic growth and state action outside their specific historical, social, geographical and political context. So, we gain a conception of the 'internal necessity of the economic logic of capitalism', yet this conception remains 'unsubverted by its political, cultural and natural exteriors' (Sandler, 1994). Such commitments, he notes in turn, fail to allow for the possibility that growth might take on different forms and that 'capitalism might still develop new modes to secure its natural conditions of existence' (Sandler 1994: 40).

Sandler's critique in essence, then, returns us to issues raised by Enzenberger, Gorz and Schnaiberg's initial formulations in the 1970s and mirrors recent issues expressed by Castree (2002) and Wright (2004). We are asked to be alert to the possibility that the capitalist production of socio/technonatures (or in Sandler's conceptualisation 'environmental regimes') could generate various outcomes. As Sandler notes, a major problem with the postulate that capitalism necessarily commodifies, internalises and destroys its 'conditions of production', is that this is seen only as a one-way process. In ignoring how an environmental regime shapes the logic of capital, by 'producing *distinct configurations* of conditions of production', there is a lack of attention by exponents of GOD/TOP arguments as to how such regimes do not only destroy conditions of production but how they can also 'produce and reproduce them' (Sandler, 1994: 45). A 'green' environmental regime thus may offer capitalist enterprises opportunities to *reduce* ecological degradation, as well as increase profit. As Fred Buttel has underscored, a tendency towards a functionalist and necessitarian analysis of state dynamics in GOD/TOP arguments underplay the manner in which states play a role in *societal rationalisation* as well as *capital accumulation*, 'just as there is a structural incentive for capital to externalise environmental and other costs onto the rest of society, there is also a capitalist logic of conservation and efficiency' (Buttel, 1998: 269).

What might be called the strong thesis, that global capitalism *is presently* developing new modes to secure its socio-ecological conditions of existence,

will be treated by readers of *Environmental Politics* with considerable scepticism (and rightly so). However, there is a more complex position that is worth entertaining, notably that there is emerging evidence that different combinations of state/capital and social movement engagements can produce very different socio-ecological outcomes.

For example, if we turn to recent studies by Mol (2003), Mol and Spaargaren (2005), Paehlke (2003) and Drzyek *et al.* (2003) (and we ignore the quasi-functionalist claims that occasionally surfaces in the sociology of ecological modernisation which maintain that modernity has alleged 'self-correcting mechanisms' to counter environmental degradation), all these authors draw from a diverse range of case studies and an extensive empirical literature to argue international diplomacy and/or domestic policy changes in certain spaces and places, in the international arena and in certain OECD nations over the last four decades, has led to some important environmental improvements: the agreement on stratospheric ozone depletion and the Montreal Protocol, acid rain in the EU, conventions against the trade in endangered species such as the Convention on International Trade in Endangered Species (CITES) and improvements in air, water and land pollution in the EU and USA. A growing body of literature on environmental policy making in a range of Northern European countries suggests that there are modest corporatist interests among certain sections of capital in diverse forms of environmental management, recycling, energy and natural resource saving, (Berkhout, Leach and Scoones, 2003), while a now-enormous literature in management studies and engineering on industrial ecology, factor four strategies, forms of sustainable technological innovation and so on (see Hawken *et al.*, 1999 and White, 2002 for a critical overview) would seem to suggest that at least sections of capital view a shift to a 'low carbon futures' as opening up a whole range of new business opportunities.

Critics of Ecological Modernisation arguments (EM) (Bunker, 1996, Harvey, 1996; Benton 2001; White, 2003; York & Rosa, 2003) have been correct to argue that critical issues continue to exist with the spatial/temporal scale to which EM works, the units of analysis that have been used in EM studies to demonstrate environmental improvements and questions relations to how we can attribute causality to environmental improvements. Evidence of environmental 'kuznet' curves and current examples of de-materialisation that avoid rebound effects remains partial and contested. The sociology of environmental justice additionally suggests the extent to which environmental legislation in the 'triad' have been achieved primarily through displacement across, time, space and other media is indeed critical, as is the extent to which the still-hypothetical promises of 'the green industrial revolution' can be fulfilled under existing socio-cultural–economic relations without generating rebound effects and other social or ecological pathologies (White, 2003). The debate continues over the extent to which the new institutions and legislative mechanisms pointed to by EM have been able to secure compliance. Insufficient attention is currently given in 'optimistic literatures' to the

priorities and power relations that find expression in global environmental agreements. Moreover, much of the current debate has scarcely begun to consider either the long-term environmental consequences of continued transformations of contemporary capitalism towards network or informational modes of production (Castells, 2000; but see Paehlke, 2003; Mol & Spaargaren, 2005) or, indeed, whether many of the environmental gains achieved in the OECD in the 1970s and 1980s celebrated by EM theorists are going to endure, given the manner in which US administrations over recent times have become explicitly, committed to a roll-back agenda, and we are now seeing the rapid industrialisation of China and India. Indeed, it seems increasingly evident that in a world order post-9/11, as Berkout *et al.* (2003: 7) note, 'the experience of international environmental governance has been one of marginalisation – especially from agreements about trade and economic co-ordination'.

These are all live issues and much still needs to be aired in this debate. However, if one reads broadly across emerging literatures in the environmental social sciences – from political ecology to environmental justice, from business literatures on green capitalism to even the more intelligent end of the contrarian spectrum – it is increasingly evident that there is a need for a much more layered debate about the combined and uneven ecological modernisation of capitalism than can be found in many current 'grow or die/ treadmill of production' circles. This is a debate about uncertainty and complexity, risk and power relations, improvements and regressions, ecological modernisation (its possibilities and pathologies) and environmental injustice. It is a debate where, as Berkhout *et al.* (2003: 11) note, summarising a decade of Economic and Social Research Council (ESRC)-funded research on the environment, it has been the environmental social sciences that have increasingly argued: 'Environmental effects are usually complex, long term and uncertain; trade offs between choices may be unclear, perceptions of both problems and solutions are value-laden and differ greatly amongst different social groups'. It is a debate that requires recognition of the negative socio-ecological effects of emerging forms of informational capitalism via the spread of global neo-liberalism. But equally this is a debate which requires attention to surprises and unexpected developments because, as Nigel Thrift has argued recently, networked informational capitalism is indeed: '... a highly adaptive and constantly mutating formation' (Thrift, 2005: 3) and that '[t]he whole point of capitalism ... is precisely its ability to change its practices constantly ...'.

The Virtues of Revisionism: Developing Political Sociologies of Socionatures

What can be said in conclusion? This article has not sought to dismiss scholarship seeking to ground environmental sociology in a materialist emphasis on the destructive dynamics of treadmill or 'grow or die' dynamics of the capitalist accumulation process; but it has been argued that contemporary GOD/TOP arguments are characterised nevertheless by a rather

odd (perhaps strategic) avoidance of very substantial literatures now emerging out of new ecology, political ecology, the sociology of environmental science or hybridity/cyborg studies which has provided serious critiques of over-generalised global crisis narratives and argued for a much more complex understanding of the socio-cultural and spatial power relations underpinning socio-ecological change. A commitment to 'crisis theory' has largely prevented serious engagement with the post-colonial critique of western environmentalism (present in political ecology) or any serious attention to the idea that political ecology might actually involve bringing the environmental sciences into democracy (Latour, 2004). Tendencies can be found towards 'quick kill' engagements with literatures on ecological modernisation and environmental reformism which lean towards quasi-Malthusian measurements of the global throughput of materials while failing to recognise that a careful location of such studies in their geographic and political specificity might tell us something about the dynamics of combined and uneven socio-ecological degradation. More generally, the desire to dismiss literatures on 'green capitalism' out of court has generated a near-complete disinterest in engaging with emerging technical literatures on industrial ecology or ecotechnology, sustainable architecture or agriculture (see Leff, 1995; Milani, 2000; White 2002). As such, rather than reading these developments in recuperative fashion as largely hypothetical but nevertheless important statements of the differing socio-ecological–technical trajectories which could diversify the possible range of no-regrets strategies, and perhaps even lead to new post-industrial paths of qualitative growth (Milani, 2000), these developments are declared irrelevant from their infancy. What follows from this, then, is that a body of environmental sociology which seems to lean increasingly towards social fatalism has notably failed to offer a compelling response to recent contrarian critiques of environmentalism (White *et al.*, 2005), and seems increasingly to offer very little in the way of envisaging viable alternatives to existing arrangements.

What might provide means of reformulating these issues? At the conceptual level, I have suggested work emerging from interfaces between the 'production of nature' school, critical political ecology and actor network theory/cyborg studies in science and technology studies is generating exciting non-dualistic forms of analysis which have opened up the ontological complexities present at the 'science' and 'nature' or 'socionatural' pole of the debate. I have also suggested that, at the 'society' pole of the discussion, presently disconnected currents in revisionist ecoMarxism, literatures on environmental justice and the more self-critical currents of ecological modernisation literatures potentially open up more disaggregated, empirically grounded and spatially aware understandings of the environmental impact of market relations, economic growth, institutional pressure, global capitalist accumulation, etc.

Many of these emerging 'technonatural discussions (White & Wilbert, 2006) are still work-in-progress and considerable theoretical work needs to be done to create more fluid bridges between such disparate traditions. However,

shifting attention from 'limits in nature' discussions to the power relations that are presently being played out in the metabolism between society and nature (Swyngedouw, 2004), and recognising that capturing these processes would involve constructing multiple narratives that relate material, symbolic and representational practices (Lefevre, 1991; Swyngedouw, 2004), potentially opens up a much broader terrain for critical environmental sociological inquiry and creates many more possibilities to transcend the neo-Malthusian/contrarian discussion.

Notably, if socionatures are always in a state of dynamic change and transformation (Botkin, 1990; Harvey, 1996) a materialist critique suggests we should further ask: how do diverse forms of domination (class, race, gender, etc.) impact on and become substantiated/embedded in the processes of metabolism which shape such socionatures (Harvey, 1996)? What impact does certain material production have on social class, gender relations, race relations, socio-ecological relations, landscapes, agrofood networks, the fate of diverse species and ecosystems, etc? What effect does a certain attempt to produce or retard the development of a certain socio-nature (across space and time) undermine the stability or coherence of sustainability for some social groups, while perhaps enhancing the sustainability of other social groups (Swyngedouw, 2004). How does it delimit the possibilities of alternative productions of nature (see Harvey, 1996; Braun & Castree, 1998; Swyngedouw, 2004)? Similarly, a symbolic/representational critique should ask: what are the power relations embedded in the environmental power-knowledge systems we are all constructing? Whose knowledges are seen as of primary importance in shaping productions of socionatures and conservation strategies? What underlying assumptions are embedded within them? Whose definition of what constitutes an 'environmental problem' wins out in environmental organisations, global environmental science, the professional concerns of environmental sociology and with what consequences?

Drawing such currents together we can ask, additionally, how are these multiple power relations (material and semiotic) situated and effective across space and time or (space – time) in various 'power geometries' (Massey, 1999)? To what extent do environmental reform strategies pursued in one place generate rebounds, externalities, spatial, temporal displacements which effect the socionatures of peoples, ecosystems, species, living in diverse spaces, times and places elsewhere?

Such questions are not exhaustive, but they could perhaps allow for a more productive rethinking of the capital/environment debate.

Note

1. This paper is concerned with some generic weaknesses that can be found in Schnaiberg's 'treadmill' analysis and broader 'grow or die' arguments that have emerged from social ecology and ecoMarxism. However, this should not obscure that there are substantial internal differences of emphasis. For an account of such differences, see Buttel (2004).

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