Get Real: Climate Change and All That 'It' Entails

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Abstract

This article builds on Carolan's three natures scheme, where he distinguishes between the strata of 'nature', nature and Nature, by overlaying his previous framework with further analytic distinctions. Doing this, the authors argue, adds an important layer of analytical and conceptual robustness that his earlier scheme lacks. After building on this framework, attention turns to the phenomena of climate change. A selection of agrifood studies on this subject is used to help illustrate the utility of the revised model. The literatures reviewed involve the following: those looking at attitudes among farmers toward climate change; the bark beetle outbreaks in British Columbia; and food regimes. With this move the authors seek to illustrate the explanatory and descriptive utility of the revised model, specifically in its ability to provide a sustained defence of a type of realism that relational social theorists implicitly ascribe to. They also show how their conceptual labours – and the ecologically embedded relational realism it brings to the fore – can help further inform the aforementioned literatures by highlighting some of their conceptual and analytic blind spots.

It has been almost 10 years since Carolan (2005a; see also 2005b) introduced to environmental sociology his three natures scheme. This framework attempts to ground our understanding of environmental events while being able to attribute causality to phenomena often ignored by sociologists, namely, biophysical variables. The intervening decade has been a renaissance of sorts for ecologically embedded sociology, though, importantly, without the reductionism that afflicted such accounts as those offered long ago by Herbert Spencer (1967) and William Graham Sumner (1971 [1914]). Today, a growing number of social scientists – including environmental sociologists but also human geographers, political scientists, science and technology study scholars, and agrifood scholars – are openly talking and writing as if nature, from an analytical, conceptual and causal standpoint, matters. With that point in mind, let us therefore be clear on what this article is *not* about. It will not dredge up the so-called realist versus constructivist debate that Carolan's articles, and others like it (see Freudenburg *et al*. 1995; Goldman and Schurman 2000), helped put to rest. As to the present state of the social sciences, echoing Riley Dunlap (2010, p. 28), we find

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> a mix of constructivist and realist, qualitative and quantitative, micro and macro, theoretical and empirical work [...] a very healthy situation, creating opportunities for scholars of all persuasions to carve out niches and offer their goods in an increasingly global marketplace of ideas.

But this is not to say we think matters cannot be improved upon, which brings us back to Carolan's three natures framework.

Whereas Carolan's original call was directed at social scientists to be more inclusive in their search for causality, this article argues that the subject of causality remains a wicked problem for everyone concerned – scientists, politicians, and the public alike – especially when talking about the wildly relational phenomena that confront us today, from climate change to hunger, biodiversity loss and a host of 'peaks' (peak oil, peak soil, peak water ...). And until we come to better grasp, analytically and conceptually speaking, those processes impelling socio-ecological change there will continue to be misunderstandings and misrepresentations (and outright denial) about how phenomena interact and about the processes disproportionately responsible for those unsustainable outcomes. To put it another way, while the social sciences seem to be coming around to the fact that the biophysical matters, we still have some way to go in forcefully articulating how sociological variables equally matter; that they, too, can have force, much like the so-called laws of ecology, and therefore constitute real events in the causally efficacious sense. We also want to make clear from the beginning that our use of terms like events and process (and later assemblage) are intentional, as they signal a style of realism that fits with the relational theorising the authors are known for (see Stuart 2008, 2010; Stuart and Woroosz 2011; Carolan 2011a, 2013a, 2013b, 2013c). (Further offshoots of the realism advocated here have been developed elsewhere by one of the authors (see Carolan 2014). We hear this critique all too often about the social sciences: that the phenomena we interrogate and the processes and assemblages we hold up as having weight (Lefebvre 1991, p. 366) are not really real – not, that is, like the phenomena that the natural sciences encounter. We hope this article provides solid footing to allow for explicitly (relationally) realist sociological imaginations to run wild. (The fact that the journal *Dialogues in Human Geography* [March 2013] devoted a forum to the issue of realism – critical realism but realism nevertheless – says something about the apprehension in some quarters of embracing the realist moniker, perhaps because many inaccurately conflate realism with essentialism.) With that end in mind, we further elaborate on Carolan's three natures scheme and provide a little more flesh to a philosophically solid but otherwise conceptually bare-boned framework that is one component of what this article attempts to accomplish: to give a full-throated (relational) realist account of the patterns and processes that social scientists claim matter so much. In doing this we also weigh into the thorny debate about what climate change *is*, ontologically speaking, for reasons we explain shortly.

The article begins by revisiting and building upon Carolan's three natures framework. The article then turns to the subject of climate change. A selection of agrifood studies on the subject is used to help illustrate the explanatory, descriptive and conceptual utility of the revised model. The studies reviewed involve the following: attitudes among farmers towards climate change; the bark beetle outbreaks in British

Columbia; and food regimes (the logic for this selection will become clear in a later section). We hope to show how seemingly disparate bodies of literature on climate change are in fact speaking to aspects of the same Thing. (The Latourian Thing: 'much too real to be representations and much too disputed to play the role of stable, obdurate, boring primary qualities, furnishing the universe once and for all' [Latour 2000, p. 119].) We also show how our conceptual labours – and the ecologically embedded relational realism it brings to the fore – can help further inform the aforementioned bodies of literature by highlighting some of their conceptual and analytic blind spots.

The framework: a revisitation and elaboration

We begin by briefly reviewing Carolan's (2005a, p. 399–407; see also Carolan 2013a, p. 5) original framework, which he constructed to resolve the so-called constructivist–realist debate. (While less pronounced in agrifood studies this debate raged in environmental sociology circles for more than a decade and to some degree still continues, thanks to climate change denialists.) In this article, Carolan (2005a) distinguishes between the three strata of 'nature', nature, and Nature (see Figure 1). Firstly, 'nature' (in quotes) is an analytic category referring to such phenomena as beliefs, ideas and knowledge. Secondly, nature (no quotes and not capitalised) refers analytically to 'the nature of fields and forests, wind and sun, organisms and watersheds, and landfills and DDT' (p. 403). 'This is the nature', Carolan (p. 403) continues, 'with ubiquitous (and obvious) overlaps between the sociocultural and biophysical realms.' Finally, there is Nature (no quotes and capitalised), which Carolan describes as 'the Nature of

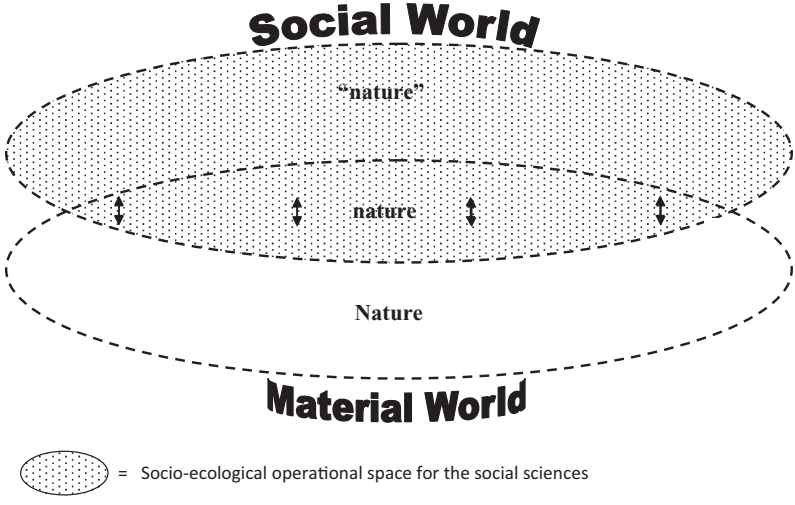

Figure 1: *Carolan's original framework*
Source: Carolan (2005a).

gravity, thermodynamics, and ecosystem processes' (p. 406). This refers to deep processes, though Carolan is careful to note that this 'depth ... should not be equated with immutability' (p. 406).

Carolan goes to great lengths to argue (and illustrate) that the arrows of causality flow in multiple directions, thus shielding his approach from the traps of biophysical and sociocultural determinism. Yet the framework could go still further as far as issues of causality and ontology are concerned. Tucked away in an endnote, Carolan (2005a, p. 414) writes that 'although there is some overlap, these three natures are not meant to perfectly reflect Bhaskar's three levels of reality: (a) the empirical, (b) the actual, and (c) the real.' However, we believe that overlaying these three ontologically interconnected levels with Carolan's three natures framework adds an important layer of analytic and conceptual robustness that his earlier scheme lacks (though we agree that the overlap is not perfect).[1]

The realism embraced here is not empirical realism but what we call relational realism. These two forms of realism must not be conflated. Relational realism argues that the world is not composed purely of experiences, which essentially encompass the world according to empirical realists, but also of causally efficacious and afficacious (Carolan 2014) processes and virtual potentials that exist even when not active/enactive. In other words, empirical realism acknowledges the existence of what is referred to in Figure 2 as the empirical (experiences, impressions, beliefs, etc.) and the actual (perceptible surface events). Relational realism, however, acknowledges the existence of these domains in addition to temporally and spatially sticky assemblages: the real. Relational realism therefore rejects the correspondence theory of truth, or what might simply be called the 'seeing is believing' approach to knowing the world. It does allow space, however, for the opposite to exist, with a

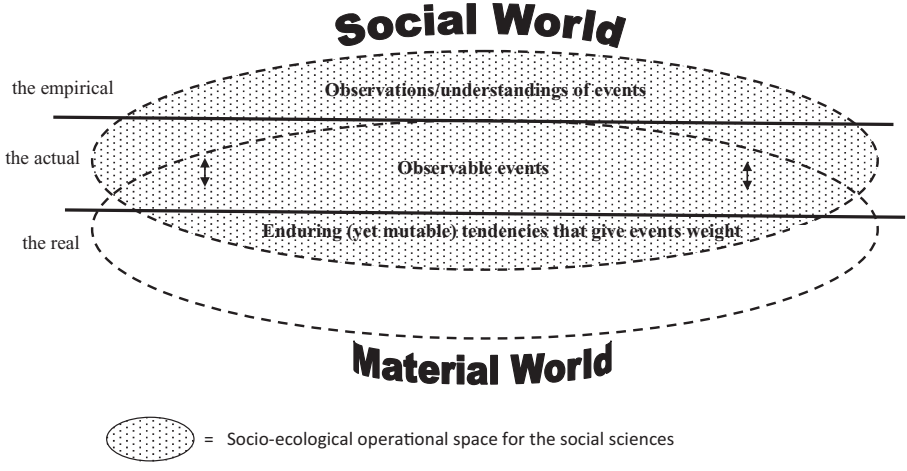

Figure 2: *Carolan's revised framework*
Source: adapted from Carolan (2005a).

visceral twist: believing and doing is seeing. As we have seen detailed elsewhere (Lowe 2010; Carolan 2011a, 2013b), weighty relationships are often the source of how we know and understand the world. Moreover, so as not to forget the original points articulated by Carolan, the revised model retains a forceful reminder to social scientists that their sociological imaginations ought equally to relationality incorporate biophysical variables when attempting to explain Things.

When we overlay these analytic domains with Carolan's earlier model we get the revised framework detailed in Figure 2. We believe this is an important addition to Carolan's earlier model, as it further legitimises the social sciences – and social theory – by pointing to the unique insight these disciplines provide into many (indeed *all*) of the issues that grip us today, from climate change to inequality, consumerism and neoliberalisms. If we want to be able to talk about these phenomena then we need an approach that allows us to make claims about what they are, in an ontological sense, which extends to what we do and the institutional patterns we enact, including (and especially) those processes that may not be immediately perceivable. Without this footing we risk falling into the traps of empiricism by implicitly embracing, in the words of Whitehead (1920), a metaphysics that bifurcates nature. From there we are practically guaranteed to succumb to the fallacy of misplaced concreteness, by mistaking surface events (the empirical) for what is real.

We cannot afford to miss what is really going on. There is too much at stake.

Setting the stage: what is climate change?

What *is* climate change? According to the International Energy Agency (n.d.), 'climate change is the change in climate (i.e. regional temperature, precipitation, extreme weather, etc.) caused by an increase in the greenhouse effect.' Or take the United Nations Framework Convention on Climate Change's (UNFCCC) definition: 'climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods' (UNFCCC 2014). In short, climate change, according to these esteemed bodies, is a 'change'. Leaving aside the fact that the definition is tautological, is *that* an ontological claim? It is not. Granted, if you push a climate scientist on the subject they might tell you something about the physics underlying the phenomena of the greenhouse effect. But that is not climate change either. The laws of physics have always been in existence, whereas anthropogenic climate change has not. Nor can we reduce climate change to greenhouse gas emissions – what Hoyer (2010) has called CO_2 reductionism. So we ask again: what *is* climate change?

In order to make realist claims about climate change – in order to say it *is* some-Thing – requires a tacit acceptance of relational realism, or something very close to it. Climate change involves, for instance, biophysical phenomena that would still exist were humanity suddenly wiped from the face of the Earth – a detail not all self-proclaimed realists are willing to admit (Professor Latour) without some degree of metaphysical indigestion (Elder-Vass 2014).[2] It also involves potentials (in the Bergsonian sense[3]) that need to not be continuously active or enacting in order to be real. We live in an open world where event regularities are far from the norm; a

complex world populated with countervailing relationalities. We cannot, therefore, limit our understanding of real structures to only those phenomena having the appearance of immutability (such as gravity). If we did, as Carolan (2005a, p. 406) has already pointed out, we would quickly find that *nothing* in the Universe meets such a threshold:

> This postulate of ontological mutability holds for the deepest of structures. Newton's inverse square law of gravity, for example, has been shown to vary since the beginning of the universe (Davies 1995). The so-called fine structure constant – or 'alpha' (those supposedly unchanging physical properties, such as the speed of light and an electron's charge, that explain how the universe holds together) – has recently been shown to be changing during the course of the past 10 billion years or so: 'Light may be slowing down, the electron's charge growing, and atomic nuclei losing mass' (Choi 2002, p. 7). Even the ironclad 'thermodynamic arrow of time' is not immune to this dynamism. It has been described – most convincingly by prominent North American physicist Lawrence Schulman (1997, 1999) – as having the potential to slow down, speed up, and even, as unbelievable as it may seem, run backward.

Climate change is premised neither entirely of internal (essences) nor external (actor network [Elder-Vass 2014]) relations. It is not, in other words, a matter of just being or just becoming. Climate change, rather, is both. Deleuze (1993), for instance, uses the metaphor of 'the fold' to grasp this blending of interiority and exteriority. This is why we can say that climate change is not any-*thing* at all, which partially explains the collective reluctance to make ontological claims about it – save for occasionally giving it the relatively innocuous term anthropogenic (see Raffa *et al.* 2008). And since it is not any-*thing* an exhaustive description of its ontology is not possible as what it is is continuously changing. But that does not mean we cannot map some of the processes and events involved in its co-constitution. Upon doing this similarities and patterns begin emerging. And it is there, in those recurring weighty assemblages that someThing enduring (yet still mutable) resides, which we locate in the analytic category of the real.

This brings us back to the categories of the empirical, the actual, and the real. We want to stress that those aforementioned categories are analytic, which distinguishes our position from that taken by, say, Bhaskar (2008).[4] Yet there seems to be value in using our analytic scalpels to dice the world up in this manner. Generally speaking, most of the social scientific literature on climate change can be located within at least one of these boxes: the empirical, those looking at attitudes and knowledge claims; the actual, those looking at surface-level drivers (such as food waste, population, transportation, over-consumption, meat consumption, etc.); and the real, those looking at deep-drivers (like food regimes, the treadmill of production, metabolic rift, and neoliberalism.). The interconnected nature of these three levels should come through in the following sections, where we review samples from the following bodies of literature: farmers' attitudes toward climate change; the bark beetle outbreaks in British Columbia; and food regimes. This exercise, as stated before, seeks to do more than illustrate the contents of each analytic box. It also attempts to be productive. By situating these studies within our revised model we believe we can point to existing blind spots that scholars might consider addressing. Moreover, it is our belief that this

exercise gives scholars investigating those analytic areas firmer ground to stand on; ground they currently seem to be lacking, to make full-throated relational realist claims.

The empirical: farmers' attitudes and climate change

Many studies in environmental sociology and other social science fields have focused on public opinions on climate change. Referring to our framework, these studies are situated most prominently in the empirical category when trying to understand what climate change is. However, as we will illustrate, by focusing only on the empirical they grasp but the tip of the relational iceberg. While some public opinion studies do enter the actual category through their exploration of factors influencing climate change opinions, most continue to overlook the influence of biophysical changes experienced as well as how deeper relationalities (in the real category) shape attitudes, values and beliefs. While the public opinion on climate change literature is extensive, we attend to a growing subset of studies focused on farmers. We draw from research conducted in the USA that use mail or Internet surveys, interviews, and focus groups in an attempt to understand farmers' beliefs and attitudes about climate change. We focus specifically on how farmers' opinions may shape their willingness to adopt climate change adaptation and mitigation practices. Agriculture is influenced not only by climate change, through changes in precipitation and temperature, but by farmers' practices, which also impact on carbon storage and greenhouse gas emissions, making agriculture an increasing focus of both climate change adaptation and mitigation efforts. However, to understand what climate change is to farmers and whether they will adopt adaptation and mitigation practices, we must venture beyond the empirical to explore the linkages between the empirical, the actual and the real.

Results from US studies show that a small majority of farmers believe that climate change is occurring; however, fewer farmers believe that human activities constitute the primary driver of these changes. Haden *et al.* (2012) surveyed over 500 farmers in California and found that, while 54% believed that climate change is occurring, only 35% agreed that human activities are contributing factors. Gramig *et al.* (2013) surveyed 2000 farmers in Indiana and found that over 79% believed that climate change is a natural process while only 45% believed that human activities contribute to it. Arbuckle *et al.* (2013b) surveyed 5000 Midwest farmers and found that while 66% believed that climate change is occurring only 8% believed it is caused by human activities. Dominant beliefs that human actions do not impact climate change are likely to reduce responses to climate change, especially mitigation efforts (Arbuckle *et al.* 2013a; Stuart *et al.* 2014).

Many studies argue that proactive climate change actions require farmers to first perceive climate change as a real risk (Howden *et al.* 2007; Gramig *et al.* 2013). However, most US farmers do not perceive climate change as a threat. Rejesus (2012) found that only 18% of over 300 farmers surveyed in North Carolina believed that climate change will reduce yields by more than 5% in the next 25 years. In general, these farmers did not expect any negative impacts related to climate change. White and Selfa (2013) interviewed farmers in Kansas and concluded that climate change was not a major concern for farmers. And if such threats were to become real, farmers

believe that moment to be in the distant future, with some even suggesting that climate change will have a positive impact on agriculture (Holloway and Ilbery 1996; Haden *et al.* 2012; Stuart *et al.* 2014). These findings indicate major challenges ahead for groups hoping to enrol farmers in climate change adaptation and mitigation efforts.

Studies on climate change attitudes also indicate that farmers are more willing to participate in efforts focused on adaptation rather than mitigation (Klein *et al.* 2007; Arbuckle *et al.* 2013a, 2013c). Arbuckle *et al.* (2013b) found that most farmers support adaptive actions, despite their beliefs about the causes of climate change, while few farmers support mitigation measures to reduce greenhouse gas emissions. Mitigation is dependent on the reason that human emissions of greenhouse gases are the major driver of climate change. In contrast, adaptation to climate variability is something farmers have always done whether or not they believe in human-induced climate change. Therefore more farmers are open to adaptation than to mitigation (Arbuckle *et al.* 2013c).

Many of the above studies examining farmers' attitudes and beliefs about climate change move into the actual category of our framework when they explore how various demographic variables (their age, education and years' farming) and farm characteristics (its size and whether it is organic or conventional) influence attitudes and beliefs. Most studies found their analyses of these variables to be insignificant or inconclusive, though a few found strong correlations. Gramig *et al.* (2013) note that farm size and having a bachelor's degree or higher were significant variables related to farmers' beliefs about climate change. A large farm size was positively correlated with beliefs that climate change is fictitious, that it is exaggerated in the media, and that programmes to respond to climate change will hurt farmers. Gramig *et al.* (2013) also found that having a bachelor's degree or higher was positively associated with the beliefs that the media is exaggerating climate change and that climate policies will be harmful to farmers. Safi *et al.* (2012) found that farmers and ranchers with a high social status, education level and income were more concerned about climate change than others. While these findings may be interesting, they only get us so far in understanding what climate change means to farmers and if they are going to somehow respond.

Most of the above studies fail to cross the nature–society divide to examine how biophysical factors (those, that is, we would analytically locate in the actual category) influence farmers' climate change beliefs. Future studies on agriculture and climate change need to focus more attention on how farmers experience biophysical change and how these experiences shape climate change attitudes and beliefs and ultimate responses to the phenomenon. A few studies suggest that those who feel they have experienced climate-related events or have noticed changes first-hand are more likely to try to mitigate climate change (Whitmarsh 2008; Spence *et al.* 2011). However, others suggest that the inherent variability of climate disguises emerging anthropocentric-induced change (Schneider *et al.* 2000; Haden *et al.* 2012). Due to the biophysical attributes of regional climate, which are highly variable, farmers may have a difficult time detecting anthropocentric climate change. Future research could more critically examine how farmers experience the biophysical aspects of climate change and how this may or may not transfer into new beliefs, attitudes, and practices.

Most studies discussing how to move forward with climate change adaptation and mitigation efforts in agriculture focus on the importance of farmer education. However, this prescription is shortsighted and overlooks the constraints imposed by the social, political and economic context in which farmers make decisions, especially those more enduring tendencies located in the real, whose 'epistemic distance' (Carolan 2006) makes them harder to point to but which are nevertheless real. Although farmer education may play a role in encouraging responses to climate change, the adoption of adaptation and mitigation practices are likely to remain limited due to the current political economy of US agriculture – the real.

In accord with relationalities that are representationally grasped by way of such concepts as productivism or neoliberalism, US agricultural policies and programmes aim to maximise production through the use of machinery and chemicals that emit greenhouse gases (Carolan 2011b). These production-oriented policies and programmes can inhibit farmers' willingness to respond to climate change (Lewandrowski and Brazee 1993; Reilly 2011). Policies that support high production and high input agriculture may constrain farmers' willingness to adopt mitigation practices that store carbon and reduce fertiliser use because they could jeopardise crop yield. The incentive structure discourages change once farmers have invested heavily in a high yield production regime – what has been called elsewhere the transgenic treadmill (Binimelis *et al.* 2009). Farmers with production contracts with large agrifood companies are often especially constrained, feeling they are unable to make production changes to reduce greenhouse gas emissions without jeopardising their contracts (Stuart *et al.* 2012, 2014).

Government programmes that protect farmers from losses in some cases allow them to remain unconcerned about climate change despite temperature and precipitation changes (Reilly *et al.* 2003). In addition, corporate agrifood actors benefit from the current system and may use their political power to inhibit responses to climate change: 'policy measures could retard adaptation by responding to constituencies that want to preserve the status quo.' (Reilly 2011, p. 350). While a few studies suggest that the political and economic structure of US agriculture will restrict farmers from responding to climate change, additional research is needed to investigate the extent of these barriers. Farmers may or may not believe in climate change. But either way, many farmers seem to feel they are unable to respond to it in the current political and economic system. Studies therefore focusing on farmers' beliefs and attitudes alone will do little to help us move forward with climate change adaptation and mitigation in agriculture. As agriculture impacts on and is impacted by climate change it will become increasingly imperative to not only address the relationalities that constrain responses to climate change but to highlight those that make doing something different possible.

The actual: bark beetle outbreaks and climate change

Returning to our analytical framework, we now turn our attention to another topic related to climate change that is most often situated within the category of the actual: bark beetle outbreaks. Across North America, forests are experiencing unprecedented

outbreaks of mountain pine beetles. While this species of beetle has always lived in North American forests, populations have expanded in number and range, reaching sizes greater than any previously recorded. As explained in *The New York Times* (Robbins 2009):

> The black, hard-shelled beetle, the size of a fingertip, drills through pine bark and digs a gallery in the wood where it lays its eggs. When the larvae hatch under the bark, they eat the sweet, rich cambium layer that provides nutrients to the tree. They also inject a fungus to stop the tree from moving sap, which could drown the larvae ... To fend off the bugs, trees emit white resin, which looks like candle wax, into the beetle's drill hole. Sometimes the tree wins and entombs the beetle. Often, though, the attacker puts out a pheromone-based call for reinforcements and more of the beetles swarm the tree.

While mountain pine beetle outbreaks have emerged across North America, the outbreak in British Columbia, Canada, represents the most severe case. In BC, beetles have killed trees across over 18 million ha of forest (British Columbia Ministry of Forests, Lands and Natural Resource Operations [BC MOE] 2012). By 2017 they are expected to have killed over 70% of the pine volume in forests in the interior of the province. Consequences of the outbreak include significant ecological changes as well as socioeconomic impacts. Various social scientists have explored the human dimensions of this outbreak, including examining impacts on timber-dependent communities (Parkins and MacKendrick 2007; Patriquin *et al.* 2007), perceptions about the outbreak and stakeholder involvement (Flint 2006; McFarlane *et al.* 2012) and forest policy (Wellstead *et al.* 2006; Nelson 2007; Burton 2010). Yet such analyses, while valuable, barely scratch the surface when it comes to understanding the underlying processe that is the bark beetle outbreak.

Natural scientists have also examined factors contributing to the outbreak, including how beetle population dynamics are influenced by changes in winter-time temperatures. There is overwhelming consensus among scientists that climate change has played an important role in the outbreaks. Beetle populations have historically been controlled by cold-induced mortality during long periods of extremely cold temperatures. However, episodes of extreme cold weather over several weeks have become less common in BC, with mean temperatures increasing by 1.5°C since the mid-20th century (BC MOE 2007). In addition, cold snaps during the autumn and spring are likely to kill more beetles and these events have become rarer in BC in the last few decades. Warming also speeds up reproduction and beetle life-cycles (Bentz and Logan 2008) and scientists have stated that mountain pine beetles are pre-adapted to thrive in a warming climate (Logan and Powell 2001).

Most social and natural science studies have overlooked social and ecological linkages and have also failed to go deeper to expose the drivers of this socio-ecological phenomenon. We argue that we cannot fully understand bark beetle outbreaks without examining the interconnections between the empirical, the actual and the real. A recent study involving one of the authors (Petersen and Stuart 2014) begins to expose some of these connections, especially the socio-ecological interactions that together created the ideal conditions for the outbreaks. From this we are able to sketch out other processes in the category of the actual that have been overlooked and also

begin to identify potentials located in the category of the real. One of the central themes of this research is to highlight certain social forces that co-constitute and help give momentum to phenomena often labeled by the media, politicians and even scientists as ecological phenomena explained by climate change.

Using extensive interviews with scientists, policy-makers and stakeholders, this research explores the ecological and social factors influencing the current mountain pine beetle outbreak in BC (Petersen and Stuart 2014). There was no doubt among the scientists interviewed that climate change has played a significant role in the unprecedented beetle outbreak. In addition, media coverage and government reports continue to depict climate change as the primary driver of the outbreak. However, what has often been overlooked is the very real role of social forces – not only those helping to drive climate change but also those giving shape to the ideal forest conditions for the beetle epidemic in BC.

Over time, the composition of forests in BC has shifted away from pre-managed conditions. Largely to support industry goals and protect timber resources, BC forest management has involved extensive suppression of fire. Beginning early in the 20th century, the BC government made fire suppression an official policy and it has been extremely effective (Hughes and Drever 2001). The incidence of fire has declined by 99 per cent and this has dramatically altered natural disturbance regimes and forest composition (DeLong and Tanner 1996). Fire typically leaves a heterogeneous mosaic of living trees and dead trees, resulting in a diverse forest landscape. The absence of fire has resulted in stands of homogenous mature trees. Mature trees happen to be the ideal host material for mountain pine beetles. Petersen and Stuart (2014, p. 608) quote a government ecologist explaining that 'a mountain pine beetle epidemic of this magnitude would not have happened, even ignoring climate change, had we not had the build-up up of mature forest.' Elsewhere they report a similar explanation from a forest manager interviewed: while some blame can be placed at the feet of climate change, past fire control resulted in more mature trees on the landscape than ever before recorded.

Forest composition has also changed in terms of tree species. BC forest policy allows timber companies to choose how to replant forests after harvest and companies have predominantly chosen to plant lodgepole pine. Companies prefer this species because seedlings are relatively easy and inexpensive to obtain and they mature quickly (meaning they can be harvested sooner), making them the most economical choice of species. However, the cumulative replanting of BC forests based on this rationale has resulted in a landscaped dominated by one tree species, lodgepole pine. This happens to be the ideal host species for the mountain pine beetle. In combination, fire suppression policies and replanting strategies have created landscapes densely stocked with mature lodgepole pine – the ideal conditions for the unprecedented mountain pine beetle outbreak. As quoted by Petersen and Stuart (2014, p. 608), an interview respondent explained that the 'mountain pine beetle outbreak is not an ecological disaster, it was caused by unnatural forest conditions. The crisis is socio-economic.' In this case, the social drivers of environmental change have had a much more powerful causal influence than has been depicted in ecological explanations focused on climate change and beetles alone. While explanations of bark beetle outbreaks have tended to focus on biophysical drivers, the assemblages are

more diverse than that. The bark beetle outbreak, while in possession of an ecological name, is a phenomenon with deeply social roots.

While this analysis illustrates how forest management has shaped bark beetle outbreaks and exposes socio-ecological linkages taking place in the category of the actual, it also begins to bring us to the real, revealing deeper relationalities shaping what the outbreak is. BC forest management must be understood within the context of changes in governance and shifting power dynamics. Governance strategies have changed over time in Canada, with (what could be generically called) neoliberal approaches increasingly being adopted at both the national and provincial levels. In accord with treadmill of production logic (Schnaiberg 1980), the state has increasingly supported the timber industry and their goals to maximise timber production and short-term profitability. As a result, forest policies have allowed timber companies to determine forest management strategies (Prudham 2007). Historical industry power increased further after a political shift toward neoliberalism in 2000. At this time the Canadian government instituted a set of new forest policies (the Forest and Range Practices Act) based on outcomes, giving timber companies the flexibility to meet forest management goals on their own terms. At the same time, government resource agencies were restructured, resulting in the loss of over 1000 employees and reducing the capacity of the agencies to monitor and enforce forest policies (Parfitt 2010). The new mission of the Ministry of Forest, Land and Natural Resource Operations (formerly the Ministry of Forest and Range) is to provide service to resource users and support a thriving resource-based economy. Over time, the power to manage BC forests has been steadily consolidated in the hands a few large timber companies (Prudham 2007). Petersen and Stuart (2014) begin to touch on these deeper forces, suggesting that neoliberal ideologies and capitalist logic were the primary drivers of forest management, creating the ideal forest conditions for the unprecedented mountain pine beetle outbreak.

Petersen and Stuart (2014) also illustrate how neoliberal trends now constrain the BC government's ability to respond to beetle outbreaks, as agencies are locked-in by previous forest policy decisions and management actions continue to support industry goals to maximise capital accumulation. As Cashore *et al.* (2001, p. 248) explain: 'the powerful inertia of the policy path established at a much earlier stage of provincial forest policy history promotes continued industry power.' As part of the neoliberal policies enacted in 2000, the Forest and Range Practices Act strips the government's ability to specifically direct harvesting. Timber companies scramble to clear-fell high-value old growth stands before they are infected, ignoring government requests that these areas should be preserved for conservation purposes and forest regeneration. Infected trees could be harvested for timber before they dry and completely lose their value, but timber companies have prioritised harvesting higher value timber. These actions reduce the viability of long-term timber supply and undermine the vitality of timber-dependent communities in BC. The timber industry has long had great influence over the BC government and together they have prioritised economic growth (Prudham 2007). The government has ultimately become unable to turn back on this path, illustrating another case where neoliberal strategies shrink the role of government to a degree that agencies can no longer meet social goals (Prudham 2004). Even when scientists predicted large beetle outbreaks in BC years ago, based on emerging

forest conditions, management strategies did not change. Forest managers were constrained in their abilities to alter forest practices as the organisational momentum supported industry goals and limited government involvement (Petersen and Stuart 2014). Thus, despite efforts to change management priorities for BC forests these underlying logics remain and continue to influence the actualisation of various socio-ecological conditions, from pine beetle outbreaks in BC to climate change more generally.

While most studies on bark beetle outbreaks linger analytically in the actual category, a further exploration of the social drivers of these outbreaks – going deeper into the real – could illustrate how growth imperatives have created the ideal ecological conditions for this unprecedented phenomenon. If we are to truly understand bark beetle outbreaks we must understand these connections. We see in this case, much as in those involving community forestry (McCarthy 2006) and the forestscape more generally (Ekers 2009), where the influence of weighty relationalities reinforce capitalist logic and the treadmill of production; processes that influence socio-ecological events at the levels of the actual (for example, its impacts on timber-dependent communities [Patriquin *et al.* 2007]) and empirical (such as perceptions about the outbreak [McFarlane *et al.* 2012]) and which in turn feedback and influence those enduring (yet still mutable) real spatialities. Forest policy in the 20th and 21st centuries has prioritised capital accumulation by emphasising an increasing role of markets, the private sector and voluntary regulation (see Humphreys 2009). Further studies could more closely link these deeper drivers with socio-ecological changes as well as society's ability or inability to respond to these changes.

The real: food regimes

The food regime approach, dating back to an article by Friedmann and McMichael in *Sociologia Ruralis* in 1989, brings together aspects of French regulation theory and political regime theory. This marriage of approaches has allowed scholars to reinterpret colonial and post-colonial food relationships as moments of stability and change – the former highlighted by periods of sticky relationalities that underpin the world economy. These relationships have been shown to have coalesced in two very different ways in recent capitalist history: a first regime comprising colonial food relations, later followed by a second regime centred on post-World War II food and aid policies emanating from the West. A key component of the food regime is the 'rule-governed structure of production and consumption of food on a world scale' (Friedmann 1993, pp. 30–1). It is therefore fair to say that its name – the food regime approach – undersells what it is ultimately about, as it 'is not about food per se, but about the relations within which food is produced, and through which capitalism is produced and reproduced' (McMichael 2009b, p. 281).

Since the publication of that seminal article in 1989 most food regime energies have been directed at identifying what new stabilising conjunctures lay over the horizon – the third food regime. (Though, just to be clear, when seen through a food regime lens history is contingent and indeterminate – it is not, in other words, a linear process.) A range of possible moments and sites of action have been discussed.

Friedmann (2005, p. 229), for instance, has pointed to an emerging 'green capitalism' regime: 'a new round of accumulation ... based on selective appropriation of demands by environmental movements, and including issues pressed by fair trade, consumer health, and animal welfare activists'. In an article that draws considerably upon Friedmann's work, Campbell (2009, p. 309) signals the rise of an emerging 'food from somewhere' regime, based on 'having denser ecological feedbacks and a more complex information flow in comparison to the invisibility and distanciation characterising earlier regimes as well as contemporary "Food from Nowhere" '. McMichael (2009a, p. 285), meanwhile, writes about global capital having entered a 'corporate food regime', marked by the 'peasantry [being rendered] increasingly unviable' as all remaining barriers – to land, labour, capital, and the like – are eliminated for the benefit of agri-business. More recent still, Gabriela Pechlaner (2012, p. 75) provides a thorough account of an emerging third 'American-led neoliberal food regime, undergirded by corporate agricultural biotechnologies' (for still other accounts see, for instance, Dixon [2009] and Burch and Lawrence [2009].)

As this brief review makes clear, there is little consensus among food regime scholars when it comes to their descriptions about the present and not-too-distant futures. So: does that undermine the food regime approach and its potential to make realist claims about the world? There is clear reluctance among even the framework's most prominent proponents to suggest that food regimes exist – that they are, in other words, real ontological Things. For instance, McMichael (2009a), in an attempt to explain why there are 'disagreements' (p. 148) among food regime scholars, as evidenced by the 'several formulations of a third food regime' (p. 148), seeks to (re)position the term as a historical concept. He writes:

> As a historical concept, it could serve to simply identify the agrofood foundations of historical periods, cycles, or even secular trends of capitalism. In this respect, the 'food regime' becomes not a structural formation in itself so much as an attribute or an optic on one or more historical conjunctures. And so: The point is *not to hypostatise food regimes*. They constitute a lens on broader relations in the political history of capital. They express, simultaneously, forms of geo-political ordering, and, related, forms of accumulation, and they are vectors of power. Thus, the 'food regime' can be considered to be *simply an analytical device* to pose specific questions about the structuring processes in the global political-economy, and/or global food relations, at any particular moment. Here the 'food regime' is not so much an episodic structure, or set of rules, but becomes a method of analysis. (McMichael 2009a, p. 148, our emphasis; see also McMichael 2005, p. 272)

Yet talk of a food regime as 'simply an analytic device' rubs against the widespread realist claims found in other publications by not only McMichael but also Friedmann. As we noted earlier, Friedmann (1993, p. 30) is repeatedly cited for conceptualising a food regime as a 'rule-governed structure'. McMichael (2014) recently even writes of an 'ontological divide' that separates competing regimes.[5] In his words:

> The ontological distinction here concerns the difference between viewing nature as external to agricultural production and viewing natural processes as integral to farming practices. In consequence, it is a distinction between deepening or repairing the metabolic rift – the disruption of natural cycles and processes by modern agriculture. (McMichael 2014, p. 36)

Certainly this distinction extends beyond how we 'view' nature – McMichael is no idealist or social constructivist. As an ontological divide it must extend down to include the tendencies and structures helping to enact the deepening or repairing of the metabolic rift. According to McMichael (2014), La Vía Campesina, for instance, resides in latter (repairing rift) world, while, say, the World Trade Organization, can be located in the former (deepening rift) world – what he terms the land sovereignty and land commodity ontologies, respectively. This acknowledgement by McMichael is quite significant. It is reminiscent of a point made previously by Carolan (2013b) in his attempt to shield the food regime approach from the criticism that those aforementioned 'disagreements' undermine its explanatory value. We need, in Carolan's (2013b, p. 419) words, to value 'each of the aforementioned food regime interventions on its own terms and allow for the very real possibility that multiple "things" are going on simultaneously.' The ontological divide named by McMichael highlights multiple active (and enactive) Things going on simultaneously; of which each side points to worlds inhabited by real tendencies (such as, rule-governed structures), as evidenced by their weighty and sticky nature.

We argue that approaches like the food regime need not shy away from making realist claims about the world, though we recognise the general reluctance among agrifood scholars to speak in such terms for fear of having one's argument mistakenly labelled essentialist. McMichael correctly points out, on two separate occasions, that 'a food regime perspective, however, is not intended to offer a comprehensive understanding of food cultures and relationships across the world' (2009a, p. 145) and 'in no way assumes that all food production and consumption conforms to this pattern' (2000, p. 421, fn). But that acknowledgement in no way undermines the ontological status – the there-ness – of those relatively stable phenomena that food regime scholars point to, which are far from ephemeral. Given the open and wild (Carolan 2013b) nature of reality we should never expect any-Thing to offer a comprehensive understanding of food cultures and relationships across the world.

If food regime scholars are so inclined, the framework articulated here could be used to better situate their explorations in (relational) realist footings. This would allow for more forceful ontological (rather than just analytic) claims to be made about world food systems as well as about the systems that seek to supplant them. Yet that is not the only way our framework could be used productively by food regime proponents. There is also the matter of, well, matter – biophysical phenomena.

Food regime thinking has not been entirely silent on the subject of social and ecological interactions. Friedmann (1993, 2005) especially has made space for biophysical variables in her analyses. She cites two key processes that lie at the heart of unsustainable relations in the previous two food regimes: distance (between production and consumption) and durability (of key food commodities). What is required, she argues, is a food regime that can better subvert these dynamics and mend the ecological rifts created by these dominant modes of being and doing that still possess such momentum. This has given her a space to make pronouncements in favour of re-embedding food in rule or norm-governed rationalities premised on locality and rationality and seasonality. Nevertheless, we believe that food regime theorists could do more to articulate the ecologically embedded nature of food systems and the rule-governed structures they presuppose.

Campbell (2009) offers one of the most important interventions in this respect to date, taking clear cues from Friedmann in doing so. Campbell introduces into the food regime literature the concepts of ecologies at a distance and ecological feedback, pointing out how prior regime relationalities masked many of their ecological impacts. Those impacts most assuredly still exist. Yet, as Campbell explains, in today's more integrated socioeconomic systems they have begun to feed back into the cultural dynamics of food regimes. As environmental and public health concerns mount social movements become increasingly fed by the resulting episteme to emerge from those novel thinkings and doings. As previously alluded to, McMichael (2014) is also beginning to pay closer attention to ecological variables in the context of the metabolic rift across competing systems of provisioning, building upon the earlier work of Araghi (2003, 2009) and Moore (2011).

We have been silent on the subject of climate change in this section. It ought to be obvious, however, that the rule-governing and norm-governing structures and tendencies sticking together those moments of (relative) stability – food regimes – are also helping to hold together thinkings and doings that contribute mightily to climate change. The curious thing about climate change, however, unlike, say, soil erosion or social exhaustion, is the level of distancing involved (Carolan 2004). There is no way to embed systems that will make climate change (or specifically its deep driving tendencies) immediately visible, which is precisely why we need interventions like those offered by the food regime approach that can empirically identify and conceptually grasp these real-but-more-than-representational phenomena. And as long as people live in places where 'locally and ecologically-appropriate food systems' (Campbell 2009, p. 310) are not possible – for example, in the middle of deserts – the food regime framework could be good to think with as we work through what it means to eat sustainably.

Yet as indicated, there remains space for the further interrogation of socioecological relations in the food regime literature. For instance, McMichael (2014, p. 51) argues that land commodity ontology 'continues the underreproduction of nature' while 'the land sovereignty vision, by contrast, seeks to restore farming as an energy converter' and build 'resilience on the land' while 'advancing the rights of smallholders to reproduce society through food provisioning and environmental stewardship.' It would be helpful to know more about the role biophysical variables play in co-constituting the sticky (real) assemblages that underpin these (dialectically-mediated) worlds. Is there a point at which, for instance, the weight of environmental degradation becomes too great for 'the market episteme [that] governs problem framing and solving' (McMichael 2009a, p. 155) in the land commodity ontology to continue to hold any legitimacy? Let us not also forget that both so-called ontologies are still referencing the same material world – what Carolan (2005a) refers to as Nature in his earlier scheme. For instance, La Vía Campesina's embeddedness in a different world does not make those residing there immune to the effects of climate change. This is not a case of 'never the twain shall meet'. These worlds collide at multiple points, as McMichael astutely points out, with climate change representing perhaps the most visible (and potentially most impactful) collision point of all. We believe the food regime approach can offer some fruitful interventions when it comes to theorising climate change, given its flexibility to grasp multiple Things – and indeed worlds – simultaneously.

Conclusion

The aims of this article are multiple: to further develop Carolan's three natures figure; to offer realist footings for the diverse styles of relational theorising prevalent in agrifood studies today (Carolan 2013b); and to make some ontological claims about what climate change is. We believe the approach sketched out above could be of particular value to agrifood scholars. At a minimum, the argument we have provided bolsters the causal and ontological claims of their frameworks and outlooks, many of which leave untouched the very metaphysical issues this article labours to develop. Our hope, however, is that this work proves to be more productive than that. In addition to offering an invitation to get others to be more open about their realism, reminding them that in tossing out the bath water of essentialism they need not lose the baby of what *is*, we have tried to open some empirical and conceptual doors so others might walk through them.

It is not our intent to be prescriptive about how one does relational scholarship. This article is in many respects more foundational than that. We hope it helps relational scholars metaphysically square the circle by allowing them to talk of a decentred, unsettled and enactive world that is real and where matter still matters. Indeed, as we have argued, relational scholarship offers a more concrete understanding of what is than other forms of (so-called) realism. It does this by not being seduced by the veil of empiricism. Nor do we need to reduce reality to exterior relations – to a world of without, with no room for an enduring-yet-still-mutable within. So: with that, we invite others to get real.

Notes

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[1] For Bhaskar (2008) reality is broken up into three ontologically distinct strata. By embracing a relational ontology we see these strata as analytic versus ontological categories. Bhaskarian critical realism and a relational metaphysics both embrace, to quote Michael Halewood (2011, p. 44), 'the processes and potentiality inherent within all existence.' Where they depart significantly is on the question of reality. Critical realism, with this talk of a stratified reality, is in danger of producing a hierarchy of being, whereby relational ontologies embrace an approach rooted in becoming. For more about the relational realism articulated here see, for instance, Carolan (2014).

[2] The indigestion we are referring to comes from Latour's struggle to deny essentialism while maintaining his grasp on realism. He has in/famously written the following: 'Did ferments exist before Pasteur made them up? There is no avoiding the answer: No, they did not exist before he came along' (Latour 1999, p. 145). But then elsewhere, regarding the claim that microbes did not exist before Pasteur, he wrote: 'If you take it as a metaphysical argument, it's completely ridiculous' (Latour *et al.* 2011, p. 44).

[3] Henri Bergson (1983 [1911]) argued there are two distinct ways to approach the question of potential. Western thought holds dear to one, the one whereby potential involves acting out pre-given possibilities – for examples look to treaties about the economy: free market capitalism (Hayek 1978) and idealised liberal democracy (communicative rationality [Habermas 1985]). At best these approaches embody a type of weak realism while at worst are strongly transcendent in their reasoning – after all, their central theme is about going beyond the material to realise an (unrealisable) ideal. Bergson opts for an alternative understanding

of potential, one where virtual forces (in the Deleuzian sense) come together to enact something genuinely new. This is not a postmodern celebration of indeterminacy but a rejection of predetermination.

[4] Bhaskar (2008) bases his argument on the question 'What must the world be like for science to be possible?' In doing this, Bhaskar is asking a transcendental question and deploying a transcendental mode of argumentation. The question here is not 'how do we have access to the world?' or 'how do we know the world?' but rather what must be presupposed about the nature of the world in order for our scientific practices to work. The transcendental, as Deleuze (1993) and others remind us, is not to be confused with the transcendent. The transcendent refers to that which is above or beyond something else. For example, God, if it exists, is perhaps transcendent to the world. The transcendental, by contrast, refers to that which is a condition for some other practice, form of cognition, or activity. Yet even using Bhaskar's a posteriori reasoning we find no reason to go so far as to argue that these three levels are anything more than analytic categories.

[5] While not explicitly conceptualised as food regimes per se it is hard to think of these competing ontologies in any other way.

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