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Is the concept of human impacts past its use-by date?

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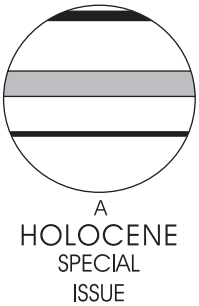

Abstract: Scientific research now shows that humans are pervasive in earth ecosystems, and have been so for many thousands of years. So it may seem strange to argue against a concept that has been so hard won and is now empirically incontrovertible. What is starting to seem stranger is that, to paraphrase anthropologist Tim Ingold, the best way we have to describe our role in the world is to take ourselves out of it. As human influence on the Earth and its processes increases, we face the profound paradox that most of our intellectual weapons in the environmental area – from prehistoric fire debates to projections of climate change – have maintained a separation of humans and nature. This is an argument based not on semantics but on false separations that are adversely affecting the quality of our research and practice, including the ways we attempt to integrate archaeology and palaeoecology. While 'human impacts' may be applicable to a subset of human activities, it is neither conceptually nor empirically strong enough for the detailed networks of human and non-human others now evident. We need to articulate a broader concept of agency, both human and otherwise, and to develop explanations that focus on associations and relationships rather than separations and essentialisms.

Key words: Human impact, actor network theory, cultures of nature, dualism, human–environment interaction, Holocene.

The paradox

Our increased understanding of *Man's role in changing the face of the Earth* (Thomas, 1956) is one of the key scientific achievements of the second half of the twentieth century. Human activities now appropriate more than one-third of the Earth's terrestrial ecosystem production, and between one-third and one-half of the land surface of the planet has been transformed by human development (Vitousek *et al*., 1997). Humans are inextricably embedded in all earth surface processes, and often dominate them.

Science shows that humans are pervasive in earth ecosystems, and have been so for many thousands of years. So it may seem strange to argue against a concept that has been so hard won and is now empirically incontrovertible. It may seem even stranger to do so at just the time the human role is finally being acknowledged in the political arena. Yet, as human influence on the Earth and its processes increases in both scale and complexity, we face the profound paradox that most of our intellectual weapons in the environmental area – from prehistoric fire debates to projections of climate change – have maintained a separation of humans and nature. As anthropologist Tim Ingold argues; 'Something … must be wrong somewhere, if the only way to understand our creative involvement in the world is by taking ourselves out of it' (Ingold, 1995: 58).

It is precisely because of the pervasiveness of human activity, and the fact that it has been around for many thousands of years, that I believe we need to critically re-examine the work that the metaphor of human impacts is doing. The metaphor is neither conceptually nor empirically strong enough for the complex networks of humans and non-humans now evident, in prehistoric as well as contemporary time frames. These false separations are adversely affecting the quality of our research, not so much in how we do it, but in our explanatory frameworks.

Because this discussion is about words and terminology, it is necessary to establish that this argument goes beyond semantics. I first examine the work done by the metaphor of human impacts, then consider potential ways to reformulate it, drawing on recent discussions in the social sciences of nature, particularly those influenced by actor network theory. Most Quaternary scientists are more comfortable putting the 'heavy lifting' into technical and methodological innovation than considering new theoretical framings and social science perspectives, but the latter should also be considered as potentially useful intellectual resources.

Work done by a metaphor

The metaphor of human impacts is there in the subjects we teach and in the dominant and extremely valuable textbooks (Goudie, 2006). As shown in an analysis of abstracts in five high-ranking prehistory journals from 1995 to 2006 (Table 1), it is the dominant terminology by which we frame our discussion of the human–nature engagement. If Table 1 is read as a continuum between the most strongly social science (*Current Anthropology*) and the most strongly biophysical science (*Quaternary Science Reviews*) journals, it can be seen that

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Table 1 Relative frequency of three terms in bibliographic citations and abstracts for high ranking prehistory journals, 1995–2006[a]

	Current Anthropology	*American Antiquity*	*Antiquity*	*The Holocene*	*Quaternary Science Reviews*
Human impact	75	50	87	92	84
Human interaction	4	32	3	2	16
Human agency	21	18	10	6	0
N	24	22	31	53	31

[a] *Current Anthropology* since 1998 only. *N*, papers containing one of the three terms. This analysis is limited because the terms 'impact', 'interaction' and 'agency' can each have a different use than the one we are discussing here. However, as a general argument, the dominant usage in the journals is exactly the one being discussed in this paper.

the use of the term 'agency' is higher in the social sciences and 'impact' is highest in the biophysical sciences, but 'impact' is nevertheless well entrenched across all these examples.

So what do I mean by the work done by this metaphor? Simply that in the process of becoming embedded in our academic discourse, the metaphor of human impacts has come to frame our thinking and circumscribe debate about what constitutes explanation. There are five features of this.

(1) The emphasis on *the moment of collision between two separate entities* (the 'impact') has favoured explanations that depend on correlation in time and space, and methodologies that are fully focused on dating, to the detriment of the search for mechanisms of connection rather than simple correlation. There has not been enough focus on the search for more subtle lags and effects, such as those summarized by McDonnell and Pickett (1993) (Table 2).

(2) The emphasis on the instance of impact further assumes *a stable natural baseline and an experimental method in which only one variable is changed*. Both are inappropriate for complex and dynamic systems, as a generation of Quaternary research has illustrated.

(3) Third, and perhaps most profoundly influential, is the way the term 'human impacts' *positions humans as 'outside' the system under analysis*, as outside nature. Let us remind ourselves that this is at exactly the same time as empirical demonstrations show how deeply entangled humans are in the fabric of the Earth and its processes. Scientific research now shows that 'most aspects of the structure and functioning of Earth's ecosystems cannot be understood without accounting for the strong, often dominant influence of humanity' (Vitousek *et al*., 1997: 494). Yet this dichotomous view of explanation and causation continues to dominate, as the examples in Table 3 show. The divisions here are dichotomous, and oppositional. This is part of a long history within ecological thought of positioning humans outside nature.

(4) Putting the significant explanatory divide between humans and nature requires us to *conflate bundles of variable processes* under the headings 'human', 'climate' and 'nature'. If we say that humans caused megafaunal extinction but we cannot distinguish between overpredation, competitive exclusion or habitat alteration, have we really said anything? Or if we invoke 'climate processes', which can include everything from astronomical forcing at 100 000 year timescales to ENSO cycles of a decade or so, and trends that can be warming, cooling, wetting or drying, how far have we got? What explanatory purchase are we losing by confining our causal explanations to this dualism, rather than any number of other possible cuts through the processes, for example between short term and long term, local and global, organic and inorganic? It is important to emphasize here that causal explanations have not kept pace with advances in empirical research, many of which have identified precisely that sort of variability in processes.

(5) A further characteristic of our dichotomous explanations is their *veneer of simplicity and elegance*. We have been ill-served here by frequent misapplications of Ockham's Razor principle. The principle that preference should be given to explanations that require the fewest number of assumptions has been incorrectly conflated with the idea that simpler explanations are more likely to be true than complex ones. Physicist Len Fisher (2005) shows a number of examples that confound this idea. In fact, the view that causality is simple takes many more assumptions than the view that it is complex.

Table 2 Examples of subtle human effects, as summarized by McDonnell and Pickett (1993)

Indirect effects	Focus is on two ecological entities of interest, but the outcome of interaction between them is mediated by a third party
An echo of the past	Historical effect that is apparent only sporadically
Lagged effects	Triggered at some time before they appear
Unexpected action at a distance	Spatial and/or temporal distance

Table 3 Examples of dichotomous framing of causation as expressed in journal article titles.

From nature-dominated to human-dominated environmental changes
Late-Holocene environment history of A: natural dynamics versus human impacts
Causes of extinction … arrival of the dingo, or human impact?
High-resolution fluvial record of B: climatic or human impact?
Environmental changes during the Holocene climatic optimum in C – human impact and natural causes
Human and natural impacts on forests along the D River: implications towards conservation and management
Declining stocks of Lake E's endemic F species: natural variation or human impact?
Natural environmental changes and human impact reflected in sediments of a high alpine lake in G

Sources: journal articles used in Table 1.

Rethinking humans and nature

The recent explosion in interest in human–nature relations in the humanities and social sciences provides an intellectual challenge to dichotomous explanations. If we value best practice scholarship this challenge cannot be ignored, as the body of work takes issue with a number of unexamined assumptions in nature–society analyses – 'assumptions that organise and, importantly, *circumscribe* the field of analysis' (Castree, 2002: 116–17). It is beyond the scope of this paper to provide a comprehensive review, but accessible entry points are found in Cronon's (1996) edited interdisciplinary volume, and Castree's (2005) focus on applications in human and physical geography.

I draw mostly here on a broad body of work that often goes under the title of actor network theory, or ANT, most strongly influenced by the work of Bruno Latour (1993). Again, there is a huge literature on this, but given the scope of this paper it can be approached through a review paper (Castree, 2002). Castree summarizes an ANT response to assumptions that organize and circumscribe our field of analysis. The examples at the heart of his paper, socioeconomic concepts such as class and capital, are rather different to the ones in this Special Issue, but the conceptual discussion is very relevant.

Some characteristics of ANT are not unique, but found more widely in critiques of binarist or dualist thinking. These include broadened concepts of agency, for example that non-humans can be significant actors, as action is not necessarily associated with intentionality and linguistic competence. The term 'actant' is often used in ANT to get away from the anthropomorphism of the term actor. Non-humans in this context include air masses, ocean currents, plants, technology, pollen diagrams and metaphors. Nor do we need ANT to remind us that discourse has power. A further example is that, where binary thinking ultimately forces a choice between things, many areas of social and natural science would seek to understand the social and the natural as *co-constitutive* within myriad networks, thus resisting a conception of power that is overly centred.

In fact there are contradictions in ANT being referred to as a 'theory', although it remains a convenient shorthand for a diverse body of thought. As many of its more ardent advocates are keen to point out, the types of explanatory frameworks it presents are the precise opposite of a grand theory. It should be clear then that I am not advocating its emplacement, fully formed, into palaeoecology and archaeology. Rather I want to focus on the value of two of its more distinctive insights.

The first relates to the binarism of the social–natural (or human–nature) dichotomy as discussed in the previous section. This is seen as:

> *ontologically incomplete.* By positing two different spheres of reality, it leads to a conception that entities are 'essentially' either social *or* natural prior to their interaction with one another. Against this 'modern' worldview (Latour, 1993), ANT argues for an 'amodern' ontology in which we recognise the 'hybrids' or 'quasiobjects' which litter the world we inhabit. (Castree, 2002: 118, emphasis in original)

It is important to emphasize that the concept of human interaction with environment – a milder version of human impacts – is also problematic in this understanding, since it retains the assumption that the social and the natural are pre-existing categories prior to their interaction with one another. A further example in contemporary ecology would be those integrative brands of the discipline that explore the dynamics of social–ecological systems, using key concepts such as resilience, adaptability and transformability. The approach is avowedly integrative of 'ecology' and 'society' (eg, Gunderson *et al*., 2005) and acknowledges the pervasiveness of humans in ecosystems (Trosper, 2005). Yet the assumption of separate systems remains curiously unexamined in this work. Further there is conceptual slippage between treating humans as different, and ultimately absorbing all human activities as part of ecosystems. ANT adamantly resists the conception of 'every hybrid as a mixture of two pure forms' (Latour, 1993, in Whatmore, 2002: 2).

The rejection of ontological binarism leads to the second insight:

> an encouragement to *think relationally, in terms of associations rather than separations*. ANT argues that things (including humans) are only definable in relation to other things … This leads, thirdly, to the network as a favoured metaphor for conceptualising socionatural imbrications … For actor-network theorists, they describe a world far richer than the society–nature dichotomy can allow, because they stitch back together the socionatural imbroglios that that dichotomy has rent asunder. (Castree, 2002: 118; emphasis added)

The idea that '[a]gency is a relational effect generated by … interacting components whose activity is constituted in the networks of which they form a part' (Whatmore, 1999: 28 cited in Castree, 2002: 121), takes us to a rather different type of explanation of Holocene processes than the examples in Table 3, as I discuss further below.

As might be expected, ANT has been subject to considerable critique over the last decade or so. The parts most relevant to this discussion, as summarized by Castree, are that in its bid to broaden the concept of agency, it flattens out difference and portrays the things of the world as all the same:

> where dichotomous thinking ultimately resorts to one pole or the other – society or nature – as explanatory, ANT refuses to look for causes lying outside socionatural networks … Moreover, it refuses the presumption that different networks are driven by the same general processes or factors ... it is only *after* each network has been carefully described that explanation can emerge. (Castree, 2002: 118–19)

With its roots in sociology, particularly the sociology of scientific knowledge, ANT is often considered to give insufficient attention to the material geographies of the world. If each network is seen as unique, the question then arises whether it is not possible to 'identify general processes of "socionature"?' (Castree, 2002: 134).

At the heart of this dilemma is the vexed question of whether the categories 'human' and 'nature' (should) exist at all, and a variety of answers to this question can be found in the literature.

Common ground and extending the operation

I see the implications being not so much in how we undertake our research methodologically, but rather in the way we understand causation and develop explanatory frameworks. In this Special Issue, and in the papers referred to in Tables 1 and 3, we see good empirical examples of studies that are spatially and temporally fine-grained, that are dealing with complexity and contingency, that likely acknowledge multiple agency. A number of these are at least partly consistent with 'a conception of action and actors which is multiple, contingent and nonessentialist' (Castree, 2002: 121).

There are several elements of common ground here. This understanding of power and agency has much in common with the so-called 'new ecology', or 'non-equilibrium' ecology, in which change and contingency rather than stability is the norm, and 'disturbances' such as fire and human actions are understood as internal to the system rather than external (Zimmerer, 1994; Stott, 1998; Zimmerer and Young, 1998). Of course, the long-term perspective provided by Quaternary science has made crucial contributions to this 'new ecology'. However, we can go further. To think of relational networks of agency frees us from the sort of dichotomous and arid debates in which anyone who invokes non-human power is labelled an environmental determinist, and anyone who invokes social forces is dismissed as appealing to the explanatory black hole of (irrational) culture.

In Australian prehistory more generally, we have had a number of empirical sources that have already prodded us to move away from a binary view of the world. By and large, like other historical sciences such as geology and history, our work is not amenable

to an experimental method where we can change one variable while holding everything else constant. It is about elucidating and interpreting the ways multiple variables have been entangled over time and space – to extend Castree's term, we have 'palaeoimbroglios'. Further, particularly in the Australian region, we have been challenged by Indigenous voices in the last several decades to consider non-dualistic world views, such as ones that acknowledge the presence of non-human actants in the social fabric. If there is one example of an entity central to our research that is neither simply natural nor social but something else and beyond, it is fire. The agency of fire is very much an outcome of its relationships – with Aboriginal igniters, managers and extinguishers; with fuel load in different vegetation communities; with temperature, humidity and wind conditions.

I have six suggestions for how our theoretical framing might catch up with the innovation in other parts of the palaeoecological and archaeological enterprises, particularly technique development.

First, in advocating more attention to theoretical framing and explanation I am interested in modest theory and anti-essentialism consistent with the notion of contingency now so well established in ecology. We should continue our deconstruction of dichotomies not just between nature and culture, but also between hunter-gatherers and agriculturalists, and the Pleistocene and Holocene. This is not to argue that comparisons and distinctions have no explanatory value, but to emphasize that they need to be established empirically rather than assumed, and to consider when, like human impacts, they have done their challenging work and are now constraining us.

Second, the encouragement to think and explain relationally, in terms of associations rather than separations, is a subtle but profound challenge. A relational perspective requires us to ask much more about and elaborate in detail the specific mechanisms of connection that prevailed in particular times and places. For any prehistoric scenario where we know humans to be present, the default assumption must be that the humans and non-humans are mutually implicated – they co-constituted the world. The question is not 'whether' but 'how?'.

Third, we need to get rid of the notion, in case it is read as implicit in the terms of reference of this Special Issue, that archaeologists deal with social or human data and palaeoecologists deal with environmental or non-human data. Or, even worse, that archaeologists necessarily prefer socially determined explanations and palaeoecologists environmental ones. The world that archaeologists are dealing with, and excavating, is full of non-human nature. The signature of human activity is expressed in and through the material non-human world – in sand, in shells, in stone, in charcoal and in ochre. The world that palaeoecologists are dealing with, for most of the time we are talking about, has people in it.

Fourth, let us also abandon the notion that acknowledging non-human agency is the same as advocating environmental determinism. As I have argued elsewhere, the notion of a humanly transformed Earth, as expressed for example in the work of Carl Sauer, arose in a climate of having to address and combat early twentieth-century ideas of environmental determinism (Head, 2000). An unfortunate side effect has been that, in the process, binarism has been reinforced rather than ruptured.

Fifth, this is not to argue that the metaphor of impacts is not sometimes relevant, but that it is an inappropriate umbrella term. Rather it should be confined to spatially and temporally circumscribed contexts with sudden changes, for example significant human arrival on small islands. On present evidence it is unlikely to be appropriate for the changes associated with human arrival on the Australian continent.

Sixth, actor network theory grew out of the sociology of scientific knowledge (SSK). It is appropriate for us to keep asking how our scientific practices constrain our thinking. In prehistory an important concern is the extent to which are dominant conceptual images – timelines, stratigraphic sections, pollen diagrams – inadvertently reinforce the binarisms of concern. We scarcely know how to represent our 'palaeoimbroglios' otherwise and I am not necessarily suggesting we should, but an understanding that our visual representations 'do work' and have agency is an important conceptual tool.

Summary

Human impacts is a hard won concept that has made a crucial contribution to our understanding of the long-term human role in Earth processes. The metaphor is doing different work now than it did during the middle decades of the twentieth century as an important counter to environmental determinism. It paradoxically reinforces the view of humans as external to the natural system, and encourages explanatory focus on simple correlations in time and/or space rather than on mechanisms of connection. Social science critiques of dualistic approaches offer useful conceptual tools that Quaternarists should pack with their dating techniques and other innovations. Some of these tools are consistent with the contingency being demonstrated in empirical studies, but we can do better. I have focused here on key insights from actor network theory. The first is that it is untenable to conceptualize entities as either 'social' or 'natural' in ontological essence, ie, existing in two different spheres of reality. Second, the phenomena that we call social or natural are constituted in networks of contingent relationships with each other, and with a range of other human and non-human actors, including us as researchers. Third, our explanatory focus should be on these relationships, on associations of complex phenomena rather than false and simplistic separations. These insights help us to understand the way different categories, such as the metaphor of 'human impacts', become reified and in turn become part of the network of agency.

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