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Cultural Geographies 2013 20: 3
DOI: 10.1177/1474474012469887

Article

cultural geographies
20(1) 3–19

DOI: 10.1177/1474474012469887
cgj.sagepub.com
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Ecological anxiety disorder: diagnosing the politics of the Anthropocene

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Abstract

The quickly changing character of the global environment has predicated a number of crises in the sciences of biology and ecology. Specifically, the rapid rate of ecological change has led to the proliferation of novel ecologies. These unprecedented ecosystems and assemblages challenge the scientific, as well as cultural, core of many disciplines. This has led to divisive debates over what constitutes a 'natural' system state, and over what kinds of interventions, if any, should be advocated by scientists. In this paper, we review the nature of the recent discomfort, conflict, and ambivalence experienced in some sciences. In examining these, we stress emerging and conjoined concerns in ecological scientific communities. Specifically, we identify, on the one hand, an expressed concern that practitioners have been insufficiently persistent and explicit in proselytizing the current risks of human impacts, and on the other hand an obverse concern that many historically common scientific concepts and concerns (like 'invasive' species) are already overly normative and culturally freighted. We identify the resulting contradictory condition as 'ecological anxiety disorder', announced either as a fearful response to: 1) the negative normative influence of humans on the earth (anthrophobia) or 2) the inherent influence of normative human values within one's own science (autophobia). We then argue, drawing on the psychoanalytic work of Jacques Lacan, that these paralyzing phobias are born of an inability to address more fundamental anxieties. Only by explicitly enunciating the object of scientific desire, we argue, as Lacan suggests, can scientific practitioners come to terms with these anxieties in a way that does not lead to dysfunction. Using a case example of island rewilding in the Indian Ocean, we provide an alternative mode of resolving and adjudicating human influences and normative aspects in ecology and biology, one that is explicitly political.

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Keywords
Edenic Sciences, invasive species, Jacques Lacan, novel ecologies, political ecology, psychoanalytic geography, rewilding, scientific culture

In June of 2011, 18 scientists published a commentary in *Nature* entitled 'Don't Judge Species by their Origins' in which they argued that threats posed by alien or exotic species are grossly overstated. More radically, the essay suggested that the field of 'invasion biology' stands on shaky ground, and that its underlying assumption – that a 'native' condition can and should be known or restored – was flawed.[1] Following a previous line of argument by the commentary's lead author Mark Davis,[2] the essay stressed moreover that given its normative underpinnings, invasion biology might be abandoned altogether as a unique science and subsumed under the broader field of community ecology. Rather than analyzing and extirpating species, the authors insisted, we might learn to accept and live with some 'novel ecologies.'

This largely innocuous claim, made in the context of a relatively obscure debate in a specialized field, set a spark and elicited quick responses. In July 2011, a half dozen defiant commentaries and letters appeared in both the journals *Nature* and *Science*, signed by hundreds of biologists, ecologists, conservationists, and resource managers, who argued vociferously against Davis and his colleagues.[3] Meetings were convened, scientists argued, and calls to battle were raised.

There is much to say about this debate and the scientific merits of the various positions, but for our purposes, these are largely beside the point. It is instead the *fervency* of the debate which raises questions about the status of scientific communities and current trends in the sources and terms of their controversies. Davis had clearly hit a nerve – what invasion biologist Julie Lockwood has called 'the third rail of invasion biology.'[4]

What makes a topic like this one the 'third rail,' a topic that dare not be broached? In part, it is that the specific topic of *alien* species carries complex interpretive baggage, lending the debate added cultural freight, as noted extensively elsewhere.[5] As we will argue here, however, this single debate is indicative of a larger upheaval throughout what could best be described as the 'Edenic Sciences' – understood to include, among others, conservation biology, restoration ecology, and invasion biology. These sciences, though rigorous and significant in every regard, share a tacit epistemological commitment to evaluating ecological relationships explicitly with regard to an a priori baseline – a condition before the Columbian encounter, or a time or place before human contact, or a place of expulsion or return – one Before the Fall. As such, Davis' call for the acceptance of 'novel ecologies' represents an existential crisis for practitioners of what might best be termed, *Edenic Sciences*. Whether or not invasion science is merely an effort at restorative nostalgia and not a unique science at all, in other words, has stakes for whole ways of doing science.

In this paper, we will review the nature of recent anxiety, discomfort, conflict, and ambivalence experienced by research scientists in fields confronting ecological novelty in a quickly-changing world. In examining the anxieties of doing science, we stress emerging and conjoined concerns in ecological scientific communities. Specifically, we identify, on the one hand, an expressed concern in the scientific community that practitioners have been *insufficiently* persistent and explicit in proselytizing the current risks of human impacts, and on the other hand to the obverse concern that many historically common scientific concepts and concerns (like 'invasive' species) are already *overly* normative and culturally freighted.

We identify the resulting condition as *ecological anxiety disorder* (EAD), announced either as a fearful response to: 1) the negative normative influence of humans on the earth (anthrophobia) or 2) the inherent influence of normative human values within one's own science (autophobia). We

then argue, drawing on the psychoanalytic work of Jacques Lacan, that these paralyzing phobias are born of an inability to address more fundamental anxieties. Only by explicitly enunciating the object of scientific desire, as Lacan suggests, can practitioners come to terms with these anxieties in a way that does not lead to dysfunction.

After briefly reviewing the case of experimental rewilding in the southern Indian Ocean, we provide an alternative mode of resolving and adjudicating human influences and normative aspects of science, one that is *explicitly political*. The approach we suggest, following Emma Marris and Bruno Latour, is one that embraces the monsters created in a world where humans exert strong influence. But it also must be an approach that enunciates its commitments and desires in political struggles and therefore productively mobilizes alliances between various at-risk polities and scientific researchers.

Cultural artifacts of the Anthropocene

The debates in the pages of *Nature* and *Science* are ones that express the emerging cultural components of the Anthropocene. In 'Anthropocene,' we here adopt the metaphoric term assigned most famously to the current geological epoch (vis-a-vis previous periods, e.g. the Pliocene or Miocene epochs, millions of years ago) by Chemist Paul Joseph Crutzen[6] to indicate a period in which human activities have come to have significant global impact. These activities include the full range of human activities on the earth, including deforestation, greenhouse gas emissions, and so on, which Crutzen suggests came to predominate in the industrial era, a period starting roughly 225 years ago, when James Watt designed the steam engine in 1784.

The struggle over invasives is rooted in a relatively young science, one born in precisely this current Anthropocene era. Invasion biology and ecology developed from the critically important work of ecologist Charles Elton in the 1950s,[7] but exploded into a field of its own in the 1990s. These fields are linked closely both to the heavily-human-influenced landscapes of the period since 1492, but also to the very recent efforts in 'restoration ecology' to reclaim and remediate environments that have been heavily degraded.[8] The core of this science is, therefore, one predicated on recovering environmental conditions that are directly or indirectly anthropogenic.

Davis's article went to the normative heart of several cherished concepts in this young field by empirically questioning claims like the widely-cited (but poorly demonstrated) one that invaders are the second-greatest threat to the survival of threatened species worldwide.[9] Davis and his co-authors point out that many species that people take to be native are indeed aliens and that many invaders have positive or neutral impacts. But they also argue something further, offering a tacit critique of the foundational concepts of ecological restoration – starting points and hopes of environmental return:

> Most human and natural communities now consist both of long-term residents and of new arrivals, and ecosystems are emerging that have never existed before. It is impractical to try to restore ecosystems to some 'rightful' historical state . . . We must embrace the fact of 'novel ecosystems' and incorporate many alien species into management plans, rather than try to achieve the often impossible goal of eradicating them . . .[10]

The message that must be taken to the public is therefore that there is nothing special about novel ecologies, and if there ever was a 'rightful' natural condition to which to return, it is inaccessible to us in a world of global environmental change.

Writing for the objectors, ecologist Daniel Simberloff stressed that restorationists and conservationists do not oppose aliens, per se, only 'invaders.' On the other hand, Simberloff argues that

aliens are indeed often terrifically pernicious and should always be watched, that their eradication is possible, and that the 'public must be vigilant of introductions and continue to support the many successful management efforts.'[11] Elsewhere, Lambertini and others[12] argued similarly against Davis and his colleagues by insisting that 'as leaders of conservation organizations with missions to protect biodiversity, we believe that the endorsement of invading species – although potentially stimulating from an academic perspective – risks trivializing the global action that is needed to address one of the most severe and fastest growing threats to biological diversity.' In other words, even if Davis might technically be correct, it is dangerous to carry on this discussion in public. Clearly then, from whichever side of the debate, the struggle at the heart of this argument is one that can only exist in a contemporary context where the influence of humanity as a significant or dominant actor in earth systems is widely accepted by all.

This colorful contest, replete with competing metaphors, is only one of a handful of creative expressions increasingly typical in scientific accounts and debates over ecological process. Such texts, visualizations, and schematics have proliferated in recent years, making them an archive of material culture of the Anthropocene, inflected with particular valences and habits of representation.

Consider 'The Human Footprint Analysis' shown in Figure 1, which indicates that a large proportions of the global land surface is significantly impacted by human activities; indeed, the analysis suggests that 83 percent of the land surface of the earth is affected (afflicted) to some degree. A product of the Wildlife Conservation Society (WCS) and the Center for International Earth Science Information Network (CIESIN) at Columbia University, the work is really a

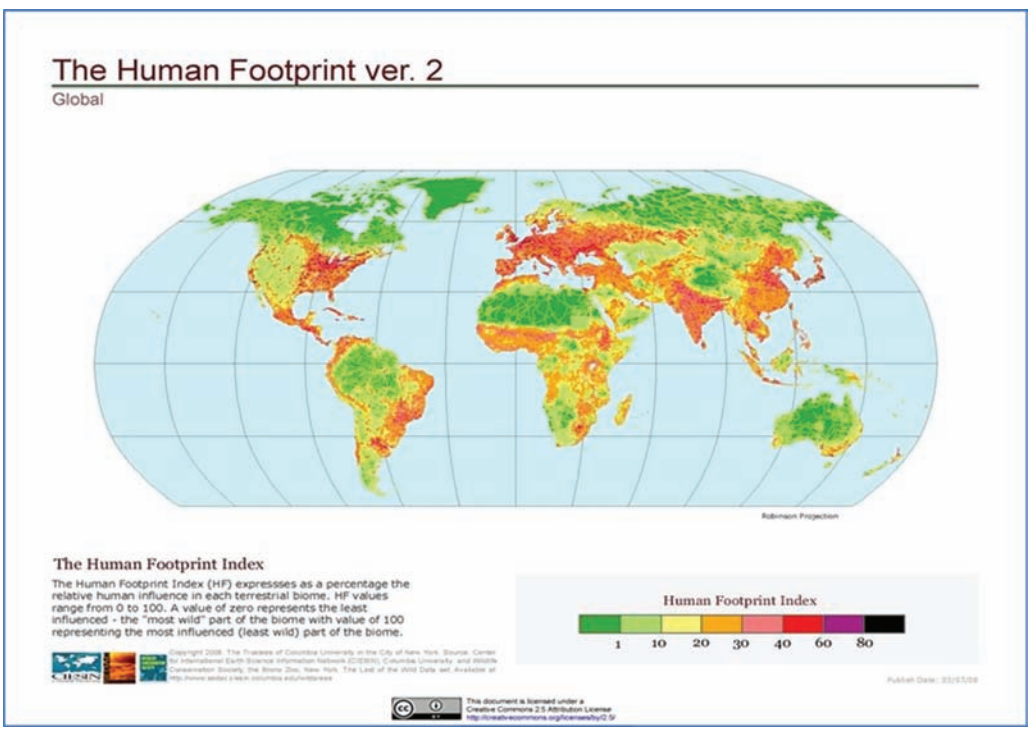

Figure 1. The Human Footprint. The Human Footprint ver. 2: Global [Map]. 2008. Center for International Earth Science Information Network (CIESIN), Columbia University. NASA Socioeconomic Data and Applications Center (SEDAC), CIESIN, Columbia University. http://sedac.ciesin.columbia.edu/wildareas

product of overlay, piling human population distribution, urban areas, roads, navigable rivers, and various agricultural lands into an indexed range of anthropogenic influence. Effectively, it maps human impact by mapping human presence.

Future archaeologists may wonder why cartographers of our period chose not to portray images of the extent of the earth's surface that have been impacted by *other* species or beings, making maps to determine how much of the earth had been impacted by microbes, for example. They would nevertheless have to conclude that the rust-colored blight on the face of the map was meant to signal acute concern of terrestrial decay, a state of fallen grace, and doubt about the possibility of return.

More ambivalent expressions also abound. The popular journalistic account, *The World without Us*, which has been called a 'Left Behind for seculars,'[13] posits what the earth might look like should humans suddenly disappear from its face. Alan Weisman's book is compelling, beautifully articulated, and fascinating, to be sure. It is also as much about the built environment as it is about the natural one, since much of its most interesting text concerns the remarkably fast rate at which human infrastructure might be metabolized by natural forces, plants, decay, and growth. The book is compelling enough to have inspired a range of nature-television versions, and parallels a serious scientific examination of the Chernobyl region of the Ukraine, an area that has indeed been reclaimed by non-humans since the time of the nuclear disaster there.

At bottom, however, the book taps into something more subtle but prevalent in the imagination of environmental scholars. Reviews of the book by figures like Bill Mckibbon and others chose to accept the fanciful premise as a kind of environmental parable, an end-times call to save the earth from humanity. The profound assumption of human exceptionalism is notable here. Indeed, a far more wild and dramatic earth-transformative premise might have been what the world would look like if *fungus* suddenly ceased to exist. The choice to depict one rather than the other marks the work as Anthropocene literature in the most formal sense. But it also stands on the horns of a contradiction: how fully transformed the world is by our presence *and* how indifferently the planet would recover from our absence. Are we too powerful a species, the Anthropocene author anxiously asks, or rather, irrelevant?

A final sample of Anthropocene culture is shown in Figure 2, a much-discussed and widely circulated figure developed by Richard J. Hobbs and his co-authors in a 2009 paper for *Trends in Ecology and Evolution* entitled 'Novel Ecosystems: Implications for Conservation and Restoration.'[14] Following increasingly standard understandings of state and transition in ecology, this schematic posits that various stresses on ecosystems can drive them into new states. In some cases, where biotic pressures (e.g. invasive species) and abiotic pressures (e.g. climate change) are insufficiently large, restoration may be possible. In other cases, where either one or the other form of pressure is great, a return may be impossible, but careful work can make the new system behave or function like that of the lost original. But where both pressures surpass the ability to return, a novel ecosystem emerges that must simply be accepted, since resources spent on its recovery would be futilely invested. In this sense, the concept of novel ecologies echoes the enjoinder of the so-called 'Serenity Prayer' of Alcoholics Anonymous, to have the serenity to accept the things that cannot be changed back, the courage to change the things that can be restored or replaced, and the wisdom to know the difference.

Anthrophobia and autophobia

What is clear from a cursory examination of this debate and of Anthropocene material culture more generally is that it relies heavily on two related tropes, both of which might have been hard

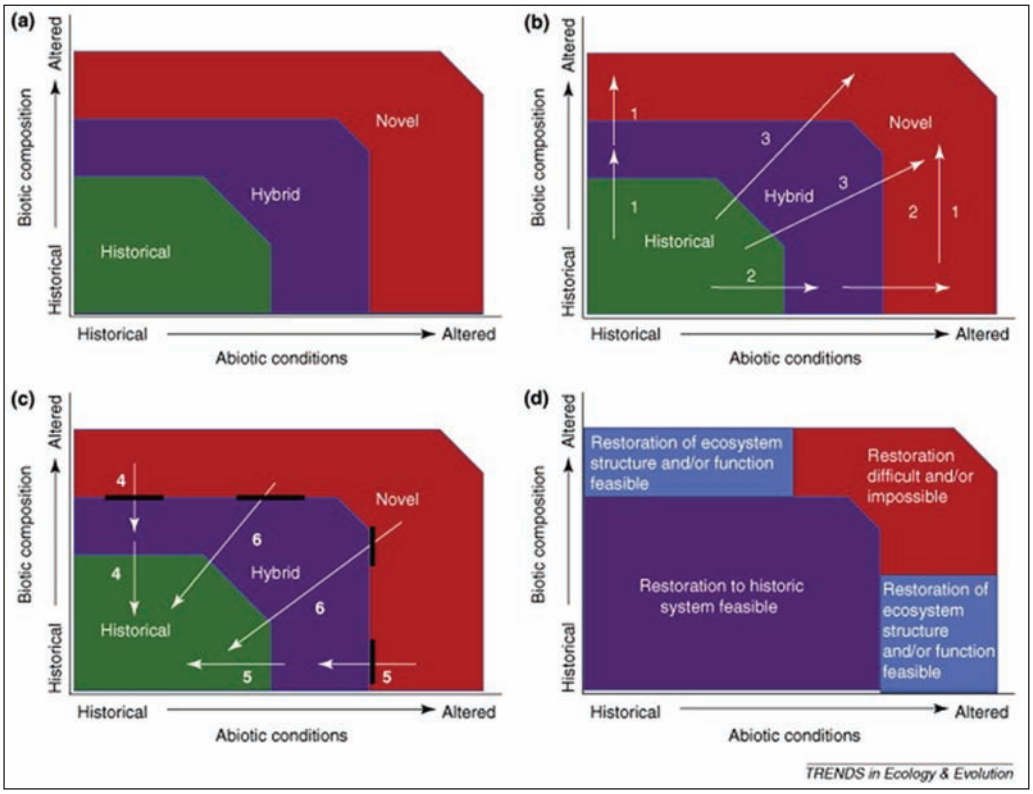

Figure 2. Reprinted from *Trends in Ecology and Evolution*, 24(11), R. J. Hobbs et al., 'Types of ecosystem that develop under varying levels of biotic and abiotic alteration', pp. 599-605, 2009, with permission from Elsevier.

to recognize for previous generations of scholars. First is the clear and abiding concern – or obsession – with human transformation of the earth to a point of irreversibility, such that whatever is in front of us is sufficiently different from the past so as to operate by its own rules. Nor is this merely an objective observation; it is accompanied by an undeniable sense of tragedy, urgency, or perhaps more often: panic. This aspect of Anthropocene culture is marked by a clear call to value judgments. We have destroyed something worth preserving; recovery, restraint, and control are imperative.

Second, however, Anthropocene scientific culture reflects a repeated concern with the vanishing of environmental baselines, grounded and normal conditions from which to make objective assessments for advocating interventions in the world. In a quickly transforming environment, deeply held human biases (like those towards nativeness) cause apparently scientific assessments of change to be fraught with normative assumptions – which must be expelled. Following in this line, some geographers have similarly advocated for the overall removal of native or alien criteria for evaluating interventions of any kind, for example.[15] This too, is often articulated in a language of concern. The scientific culture of the Anthropocene therefore exhibits a nervous habit of eschewing precisely the implications of its own enunciation and a fear of making value-judgments about the state and trajectory of environmental change.

Anthropocene scientific culture thus simultaneously displays a panicked political imperative to intervene more vocally and aggressively in an earth transformation run amok *and* an increasing fear that past scientific claims about the character of ecosystems and their transformation were overly normative, prescriptive, or political in nature. Agonizing over the role of advocacy, especially in conservation, has therefore become a literature in the field all its own.[16]

This internal contradiction is what turns Davis' assertions described at the outset – to rethink the categorical nature of species and the 'framing' of invasion science – into a scientific 'third rail.' On the one hand, gazing back at the arbitrary categorical delineations of 'good' and 'bad' species through a cultural lens, Davis despairs of the value-laden nature of previous scientific efforts in invasion biology, and seeks to dethrone the normative assumptions within past science that have directed us to perverse outcomes and decisions. He seeks a way back to a more 'objective' assessment of the long, non-teleological arc of ecological change, calling for restraint on the languages of return, disaster, and recovery.

Seeking to purge human judgment from science, or at least to leave such judgments to others (economists?), Davis articulates scientific *autophobia*, a fear of our own political language and assumptions in scientific assessment. For Davis, the Anthropocene's murder of a clear, desirable, and 'good' ecological condition to which to return heralds a caution against polluting science with a romance of the lost past: 'Classifying biota according to cultural standards of belonging, citizenship, fair play and morality does not advance our understanding of ecology.'[17] Chastising the normative judgments of past practitioners, Davis insists that the public should not be led into unnecessary concern, and should instead be told that some 'alien species are useful.' In this sense, the Edenic Sciences are too normative and too political for their own good. A new invasion biology would treat all 'phenomena in a purely descriptive manner . . . [and] avoid usage of hybrid language that mixes values with scientific concepts.'[18]

Davis' critics, conversely, find such assertions profoundly disturbing. Because human activities have, for them, so self-evidently transformed the earth through precipitating ecologically destructive species invasions, this is precisely not the time to send a message of 'relativism.' Articulating an *anthrophobia* rooted in their despair of global species decline, they insist that 'the public must be vigilant' (in Simnberloff's words, quoted above) of invaders. Science has not done too much proselytizing, it has done too little. It is arguably, *not normative enough*.

The rate and surprising character of the earth's recent transformations have, in this way, directed attention to a schism that has always sat at the heart of environmental sciences – a fear of normatively bad human influences upon, and separations from, the 'natural world' mirrored by a fear of the inherently normative and political character of the science bearing on that concern. At precisely the emancipatory moment that ecological science has transcended the flawed expectation that a single ecological condition can provide the blueprint to regulate and guide human behavior – whether nature, wilderness, or the biogeography of the pre-Columbian period – the community ironically finds itself paralyzed by acknowledgment of human agency on the earth and the normative character of science itself.

This paralysis, it might be concluded, is the regrettable dysfunction that develops when anxiety turns to phobia or fear. *Anxiety*, in the psychoanalytic view developed by Jacques Lacan, is a normal condition and guiding motivation for science. Distinguished from fear, which has a specific cause and is associated with adaptive behaviors (fight or flight), anxiety presents the sufferer with the disintegration of the self. Rather than having a specific object, anxiety is connected to the threat (actual or impending) of losing something critical to the subject: 'Anxiety, as we know, is always connected with a loss . . . with a 2-sided relation on the point of fading away to be superseded by something else, something which the patient cannot face without vertigo.'[19] To be clear, anxiety is part and parcel of scientific enterprise, the haunting absence that directs research to the unknown.

While anxiety revolves around an absence, Lacan observes, it is commonly replaced with fear, in the form of a phobia, which allows the sufferer to focus on a particular object and so symbolically target an external problem or object.[20] This displacement is problematic, insofar as it does not address the unresolvable but more fundamental underlying condition, and because it directs irrational energy towards objects or conditions that may be otherwise harmless, or at least inevitable. In this way, both the anthrophobe and the autophobe have replaced the anxiety necessary to scientific inquiry (see below), with a phobia (of people or of the self) that is expressed in terms of their inability to explain or act effectively in the face of ecological concerns. The anthrophobe despairs: 'why can't I convince the world to act before the ecology is impaired beyond recovery?' Conversely, the autophobe asks, 'who am I to impose my own vision of the world's proper structure or function on science?'

Are ecological phobias a form of political disorder?

To be clear, these diagnoses are not criticisms of ecological scientists, who have precisely and rigorously identified and tracked very real material changes in the condition of the planet. Rather, this diagnosis directs itself to the culture of the science, naming the condition that makes progressive intervention in a changing world unnecessarily difficult. Following Lacan, we argue that this is because anxiety itself is fundamental to the search for knowledge and scientific practice, whereas the fearful phobias of Anthropocence culture (anthro and auto) displace that necessary tension.

Lacan, in his discussion of scientists in 'Subversion of the Subject,' argues that academics are prone to the kind of melancholy that has at its base a drive to understand what he calls the *objet petit a*.[21] This *objet petit a* is the 'object of anxiety par excellence' – the 'essential object which isn't an object any longer, but this something faced with which all words cease and all categories fail.'[22] While the *objet petit a* is variously defined in Lacan's work, it is generally the object cause of desire. In this case, the desire for knowledge, the admirable core of the scientific urge, can never be completely fulfilled because it centers on the elusive, non-symbolizable *objet petit a*. This has implications for the study of ecology in the Anthropocene where nature itself, and explanations for natural phenomena, are the object cause of desire.[23] As such, nature is an ever-receding object that escapes the scientist's grasp (physical and mental) and generates anxiety through the impossibility of possession.

The disordered condition of phobia, however, though rooted in this anxiety, becomes a more problematic expression of this anxiety when unaddressed. Specifically, Anthropocene phobias articulate themselves over the symbolic crisis born of the end of nature, understood here as an imaginary or cosmological state and order that provides the grounding orientation point for adjudicating interventions and actions in the world. It is not necessarily a form of Cainotophobia that prevails therefore in the Anthropocene – a fear of change or novelty itself – but rather a fear of lacking a normative way to judge human actions and decisions in a world condition without precedent. In the absence of an organizing moral compass for protecting ecosystems from human action or directing human interventions, a role historically filled by a reconstructed or imaginary past, it is little wonder that the core experience of ecologists would be one of disorientation, really *a fear of getting lost*.[24] As Evans argues, following Lacan '[a]nxiety is this point where the subject is suspended between a moment when he no longer knows where he is and a future where he will never again be able to refind himself.'[25] Now experienced fearfully, this disorientation seizes the observer as phobia, and leads them further away from its own underlying source, settling attention instead on external (people) and internal (self) objects. And to the degree that efforts to reach a

consensus on addressing novel ecologies are at an impasse, as suggested by many circular debates within the field, these phobias do indeed represent a disorder, or a distraction.

Yet countless basic decisions about the present and future still confront us, which have to be made one way or another. Do we bodily assist endangered species to move in the face of climate change?[26] Do we freeze species germplasm for the future or do we conserve them in situ?[27] Should we introduce new species into transformed or damaged ecosystems in an effort to recover or discover new function, or do the inevitable uncertainties accompanying such novel permutations represent too great a risk, merely an extension of the destructive experiments that brought us here?[28] As a result of these imperative practical questions, most of the proliferating literature dedicated to ecological novelty represents an effort to replace this lost orientation point with an alternative.

In searching for a new magnetic north, residents of the Anthropocene do have some traditional (albeit equally normative) ecological tools in their kit to try to address these decisions: ecological structure and function. Both of these, however, have limited applicability and raise as many normative questions as they answer.

Structure refers, in a general way, to the species abundance and composition of an ecosystem at any point in time, a 'compositionalist' way of determining whether a current ecosystem state resembles its evolutionary heritage – and therefore its appropriate condition.[29] As many observers have noted, however, predicting how and why these change has become highly problematic now that simple succession models have given way to more complex dynamics. Moreover, it is increasingly clear that some system elements can be replaced wholesale with others, though to unknown effects[30]

Finally, many ecologists have long held that structure is arbitrary, organized by historical accident and path dependence, and by no means governed by a single set of rules.[31] Where an historical structure might be knowable or analogues might be founds in other systems, they may have little or no applicability to a novel ecosystem. Structure is therefore by no means a simple adjudicator of the proper or most natural state of a system. It cannot provide a guide, on its own, for what a novel ecosystem *ought* to look like.[32]

Function is equally problematic. Though not to be confused with anthropocentric 'usefulness,' function is nonetheless an effort to classify species based on ecological behavior and similarity, what species *do* within a larger system, like producing biomass or metabolizing nutrients. In this way, ecosystem function allows observers to catalogue the kinds of gains and losses that might be at stake in the transformation of an ecosystem but also, to consider how different or novel ecosystems might equally provide the same services as lost ones and so stand in for one another.[33] Function is in this sense an equally unstable classification, since the characteristics of species are interpreted as serving particular 'purposes' in the larger system, a somewhat arbitrary delineation.

Problematically, moreover, determining which function is desirable is a further normative decision that ecologists eschew, or at least insist is separate from scientific assessment. This makes the adjudication of preference a process scientists have increasingly preferred to turn over to economists, through the concept of ecosystem 'services.'[34] This last move, to surrender concepts of value and valuation to another science (i.e. economics) in the hope that a rational and optimal decision can be reached free again of value, is one made by default, but also one with further normative implications, indeed political ones.

Thus, traditional (normative) ecological concepts do not, in and of themselves, provide sufficient purchase to evade the fears confronted by scientists in the Anthropocene. This is because the application of either structure or function to these problems inevitably results in the tacit positing of political questions. What work do anthropogenic landscapes do? To whom does value flow from novel landscapes? Whose material and political labor do ecosystems do? Though these are difficult

questions to answer, the selection of any ecological intervention must pass through sites of struggle over such priorities and so through the relativistic thicket of ecological anxiety.

So if the contradictions of the Anthropocene make it impossible to evade anxiety, how might we address the phobias that hinder practice and action? How might we get beyond these?

The answer, Lacan suggests, is to step beyond phobia and engage more directly anxiety itself and the urges that inevitably produce it. The psychoanalytic treatment of affects for Lacan, of which anxiety is paradigmatic, is therefore 'not the reliving of past experiences, nor the abreaction of affect, but the articulation in speech of the truth about desire.'[35] In contrast to other forms of adjudicating right and wrong action, '[t]he psychoanalytic ethic . . . forces the subject to confront the relation between his actions and his desire in the immediacy of the present.' The question for the phobic subject to answer is thus: 'Have you acted in conformity with the desire that is within you?'[36] Because the subject for Lacan emerges in the field of language (the symbolic order) this question can be reformulated: 'have you acted in accordance with your desire?' becomes 'have you spoken well?' To speak well in this sense, to enunciate, is an act – one that moves the subject beyond anxious paralysis.

More specifically then, to cure our condition, we must accept the radical ruptures made possible by understanding and articulating the *politics* of novel ecologies. In the process, we must enunciate (literally speak) novel ecologies and why we want or do not want them in their specificities, admitting the very normative and power-laden urges that such a naming will expose and make transparent. It is further likely that in the process we will admit to our desire to alter the world even as we measure it, and to create new ecologies even as we fear them.

We suggest, therefore, that coming to terms with our ecological desires will force us to admit that novel ecologies are simultaneously 1) *gardens* of our own crafting albeit, in the words of Emma Marris, wholly unruly and rambunctious ones,[37] 2) *monsters* born of our tinkering albeit, in the words of Bruno Latour, ones deserving of our love,[38] and 3) as sites of *struggle*, albeit in the words of Neil Smith, ones of production and accumulation.[39] Understood this way, paths emerge in the forest to guide our decisions to either proliferate or extirpate novel ecologies.

Island rewilding as therapeutic political theatre

Consider Dennis Hansen. He and his colleagues at University of Zurich, University of Bristol, Mauritian Wildlife Foundation and elsewhere, are engaged in producing novel ecologies. Specifically, at island sites in the Indian Ocean, they are engaged in a large-scale experiment to restore the native vegetation, including especially the slow-growing ebony hardwood *Diospyros egrettarum*, a tree that once covered the lowland and coastal parts of the islands of Mauritius but which was almost wholly wiped out through successive human occupations and colonial and post-colonial settlements and waves of exploitation.

The central barrier to successful recovery of this historic and prehistoric forest landscape, however, is that germination and dispersal of the tree's huge pungent fruited seeds depends heavily on their rumination in guts of giant tortoises.[40] Regrettably, there has not been a giant tortoise on Mauritius since the *Cylindraspis inepta* (Saddle-backed Mauritius giant tortoise) went extinct from over-harvesting by colonial naval vessels; the last saddle-backed giant tortoise was sighted in 1795.

Hansen's and colleagues' solution to this conundrum is to introduce an exotic substitute to the region's islands – the Aldabra giant tortoise (*Aldabrachelys gigantea*).[41] By substituting an *alien* species for a long-gone relative on the island of *Ile aux Aigrettes*[42] and *Round Island*,[43] both off Mauritius, Hansen and associates are violating many of the founding principles of restoration and

operating in a place slightly beyond the precautionary principle. Initial results, however, are enormously promising. These tortoises are ingesting the fruits, distributing their seeds, and enhancing tree seed germination since those seeds passing through the gut of the tortoise have been shown to be far more successful than those that have not. The implications of this for further similar efforts are notable, since many other frugiovore species were eliminated around the world during the colonial era.[44]

This effort is most accurately described as 'rewilding,' defined here as the introduction of proxies for extinct species in order to reconstruct the structure and function of pre-human or 'natural' ecosystems, providing, in Caro's terms 'ecological proxies for such extinct ancestors.'[45] Proposals for this sort of effort were made famous and infamous in 2005, when Josh Donlan and colleagues asserted the need to introduce proxies for species extinct since the Pleistocene species across North America, including African cheetahs (*Acinonyx jubatus*), Asian (*Elephas maximus*) and African (*Loxodonta africana*) elephants, and lions (*Panthera leo*).[46]

Opponents to rewilding have been vociferous, pointing to the unfitness of African species for North America, the potential damage to extant populations in the sending locations, and the more general problem that most species introductions result in ecological disaster[47] (consider the Australian experience with the Cane Toad). These debates revolve around a great many uncertainties, including the practical limits of such efforts, the limits of their social acceptance, and the questionable use of scarce conservation resources in what might be a boondoggle. Even supporters of the overall idea concede that it is one that reflects 'an air of desperation.'[48]

But within these scattershot concerns, we can see the imprimatur of the phobias borne of Anthropocene scientific culture. They touch directly on whether science has become too normative or not normative enough, too advocacy-rooted or, instead, inadequately connected to advocacy for nature. Returning to the tortoises of Mauritius and Madagascar, it is not hard to already hear the cries of both autophobes and anthrophobes. For anthrophobes, this sort of experiment must appear all-too-human. From this view, island rewilding is a move away from conservation in any traditional sense and a kind of brazen action that further extends risky human impacts borne of hubris. Autophobes have much hand-wringing to do as well, however, since the contradictory introduction of exotics in the name of restoring a lost, imaginary wilderness seems like a dangerous elision of science and normative practice. Who are we, after all, to name one form of reintroduction dangerous and the other restorative? Such an effort surely transcends Davis' call for a largely descriptive science.

Adjudicatory criteria must lie beyond either our concern about the a priori desirability of human action or our urge to a more objective way of evaluating actions and outcomes. Instead, as noted previously, the political character of the environmental intervention must be addressed head-on. What are our desires and how are they entangled in the desires of others? To whom does value flow in this odd experiment and at whose expense?

In that regard, one must initially hold in profound suspicion the role and desirability of Anglo-European researchers conducting experiments on landscapes long ago wrest from the control of local populations. The landscapes of Mauritius are, after all, the political ecological inheritance of French and British colonial struggles and pillage in the Southern Indian Ocean, forged in the network of global systems born of development of global naval power in the 1700s.[49] It was European sailors who feasted on Saddle-backed giant tortoises until they were driven extinct in the 18th century and European colonists who stripped the ebony hardwoods of the islands. Who are colonial hegemons to return to these islands and 'restore' them for their own scientific edification?[50] Conversely, what would encourage or allow the source islands for these tortoises – the Aldabra Atoll in the Seychelles in the western Indian Ocean – to surrender their rare tortoise populations to

postcolonial scientists for export to islands far away? Put in bare political terms, what could possibly make the conduct of such experiments desirable for those who live around or govern these islands?

An answer lies in the political geography of the islands themselves, considered within the context of global climate change. Ile aux Aigrettes is a flat sandy coralline limestone formation, poking its head above water only slightly, reaching only 13 meters above sea level at its highest point, but with most of its landscapes within a meter of the sea. Aldabra Atoll has a land area of 155.4 km², making it the second-largest raised coral atoll in the world, but also with an average height above sea level of only 8 meters.[51] With a one-meter rise in sea-level predicted under some current projected global change models over the next century,[52] *inundation is looming*. The political economic motivations of both sites in this experiment are therefore linked closely in the production of a global understanding of island nation threats.

In October of 2009, Maldives President Mohamed Nasheed and 11 of his government ministers donned scuba gear and held a cabinet meeting beneath the sea, in time to highlight the spectacular failure of climate talks in Copenhagen that year.[53] Through a spectacularly performative gesture, the global media were captured by the event and forced to report sea-level change projections and basic facts about the topography of the earth's most vulnerable polities. For the Seychelles and the key offshore sites of Mauritius, no less than for the Maldives, the immediate existential crisis of global climate change therefore looms far more prominently than the possible downstream impacts of some tortoise run amok. Indeed, the strange scientific desires of rewilding conservation experimentalists, are in this case precisely suited to the creation of opportunities for alliance with historically colonized places and people to produce what might best be described as *experimental conservation theatre*. By simultaneously *producing nature* while drawing attention to the *production of nature*, in terms explicitly congruent with those articulated by Neil Smith,[54] the tortoise project cuts the Gordian Knot that otherwise ties the hands of Anthropocene researchers.

While an autophobe might reasonably ask, therefore, whether rewilding the Indian Ocean is a Colonial White Restoration Fantasy freighted into a normative, scientific experiment, and an anthrophobe might cogitate on whether such an effort is instead a potential Frankenstein Nightmare, both would be missing the point. The merits of the so-called 'Zurich-Aldabra Research Platform' must be sorted precisely in terms of its political role in presenting and confronting the larger ongoing experiment on the earth's climate system: an experiment promulgated by the world's wealthy and powerful, largely at the peril of the world's poor. Indeed, at both research islands, ongoing evaluation and assessment of climate change impacts are central features of the intervention. Allowing conservation to be explicitly, honestly and strategically political, therefore, opens a way to come to terms with, and perform proactively in, the Anthropocene. Enunciating desires, while acknowledging those of others, science and action proceed hand in hand.

It might be added that such experiments have the further merit of providing a therapeutic opportunity for phobic researchers themselves. As Hansen and his colleagues point out, the merits of these specific island experiments are that they are largely reversible and mostly local in impact. These conditions exactly reproduce one of the clinically proposed treatments for phobia: cognitive-behavioral therapy. Specifically, 'interoceptive' therapy simulates the symptoms that produce the fear and panic in phobic patients, but under conditions regulated by patients themselves, allowing them to experience the sources of their phobia in a controlled environment.[55] Learning to live in a world crafted by people but always beyond human control, where scientific concepts and practices can never exist wholly beyond the political desires and entanglements in which they emerge, small doses of confrontation with produced natures may allay the anxieties of scientific practitioners operating in the Anthropocene.

Living in Anthropocene political ecology

In her recent book *Rambunctious Garden: Saving Nature in a Post-Wild World*, Emma Marris describes the Sandhill Cranes gathering at the Platte River in Nebraska, noting that the landscape into which the birds descend is largely an artificial product of agro-industrial development. Does this make it counterfeit, she asks: 'Nope. Not in my opinion. Humans and birds have collaborated to create this beauty. This conscious and responsible and joyful cohabitation is the future of our planet, our vibrant, thriving, rambunctious garden.'[56] Like the tortoises of the Indian Ocean, the cranes *belong because they are there*, and not vice versa.[57]

Of course, Sandhill Cranes are the easy case. What do we make of more foreign fellow-travelers on the planet, like Bt cotton, or nuclear waste? As Bruno Latour has reminded us, these too must be treated with careful symmetry. In his essay 'Love Your Monsters' he reminds us that the tragic narrative power of Mary Shelly's Frankenstein is rooted in Victor Frankenstein's moral failure. But this moral failure 'was not that he invented a creature through some combination of hubris and high technology, but rather that he abandoned the creature to itself.'[58] Embrace the solutions and the problems posed by technoscience; Bt cotton and nuclear waste must be addressed head-on, and not evaded through simple refutation and Edenic retreat.

For Latour and others, however, the adjudication of such choices and for deciding which monsters to create and which to love is largely a question of good liberal and communicative collective discussion under a new kind of constitution. Convening a liberal 'parliament of things' in a more democratic fashion, they suggest, would allow us to outline the division of powers that could govern how humans and non-humans are represented.[59]

As has been noted elsewhere, seeking to adjudicate post-environmental decisions through liberal mechanisms, whether concerning cranes, tortoises, or hazardous waste, is optimistic in a world of spiraling asymmetries, as where the people of the Maldives face extinction at the hands of indifferent and distant SUV drivers, as well as those of manufacturers whose accumulating surpluses hinge on marketing and selling fuel-hungry vehicles. A parliament convened under such conditions is politics without politics, as Wainwright observes: the metaphorical powers of a new constitution 'are presented with no analysis of the barriers that exist to their actual existence and no discussion of how they might come into being.'[60]

As such, though we must first accept that these island landscapes are effectively gardens as described by Emma Marris, populated with lovable Lautourian monsters, we must also acknowledge that not all novel ecologies are the same, and that parties to their adjudication are unlikely to symmetrically share the stakes during any sort of polite parliamentary procedure. Sorting of novel ecologies must be of the kind shown on Ile aux Aigrettes and Aldabra Atoll. Ecological scientists will have to enter into forcefully political alliances, in which the stakes of their experiments are linked to the fates of interested parties, and do so with stark honesty about what they want. Here, it will be essential to explicitly produce experimental natures (i.e. new island ecosystems), but to do so in collaboration with polities interested in explicitly opposing other productive and accumulative experiments (i.e. global carbon loading).

Such an intervention, and the grounds for supporting or opposing it, must be developed through scientific research that acknowledges, is steeped in, and enunciates the stakes that differing outcomes may have for players positioned very differently around the landscape, including investors in genetic research startups, farmers experimenting illegally with introduced seeds, and local peoples for whom crops might be sacred. Thus neither Davis (an autophobe) nor his critics (anthrophobes) can transcend the intractability of their positions in the absence of political self-appraisal, a therapeutic speaking of how their positions are entangled in the politics of control over climate, land, and oceans.

We have not argued here, therefore, that any specific ecological intervention is, *a priori*, better than another. Neither destroying exotic species nor setting more of them loose on the landscape can be known in advance to be preferable or problematic.

Nor have we argued that the sciences of conservation biology, restoration ecology, and invasion ecology, which are directed to these conundrums, are ill-suited to the future we face. Indeed, the decisions we confront in this brave new world require precisely the kind of science and findings provided by the invaluable research of Edenic Scientists, of Davis, and of his critics.

We have, however, suggested one way forward in world that is always already beyond our control, but which often responds to frighteningly to our actions. By directly confronting what we *want* as scientists and citizens and acknowledging where these desires put us relative to others in the world, we can begin to sort through what to measure and what to change, what to alter and what to preserve.

And in so doing, we can come to terms with our fears. It is true that regular aerobic exercise, improving sleep hygiene and reducing caffeine are useful in treating anxiety. But in the uneasy world of the Anthropocene, a more direct treatment will come from enunciation in the Lacanian sense: 'the articulation in speech of the truth about desire.'[61] That is, by naming the politics of intervention and admitting the struggle that follows from embracing novelty, we might conquer our phobias and dispense with imaginary places to which there is no hope of return. These together can help throw the switch to shut down the power that makes the third rail of conservation and ecology so dangerous for scientists to touch.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements

A previous version of this paper was presented in the *cultural geographies* Annual Lecture at the annual meeting of the Association of American Geographers in New York City in 2012. Thanks especially go to that journal's editors, Tim Cresswell and Dydia DeLyser. The substance of the argument presented here is the product of interactions with ecological scientists and artists at the conference on Ecological Novelty, held at Monte Verita Switzerland in 2011, and convened by scholars at Eidgenössische Technische Hochschule (ETH) Zürich, especially including Angelika Hilbeck and Christoph Kueffer. We are indebted to Christoph Kueffer for his insights into Seychelles ecology and conservation politics and his explication of ecological function.

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