Geologic Life: Prehistory, Climate, Futures *or do fossils fuels dream of geologic life?*

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> 'As the archaeology of our thought easily shows, man is an invention of recent date. And one perhaps nearing its end' (Foucault 1970, 387).

> 'It seems to me that we can push even further the impetus to antihumanism by acknowledging the formative, productive role of inhuman forces which constitute the human as such and provide the conditions and means by which it may overcome itself' (Grosz 2005, 186).

1.1.1 Two fossils talk across time about *geology life*

This paper is structured as a conversation between two fossils—one from the prehistory[1] of human origins, the other from the future of the Anthropocene—in a conversation about time, geology and inhuman becomings. Both these geologic fossils, of human origins and the future fossils of the Anthropocene, structure a material and conceptual archaeology of the human in the context of climate change. And, both fossils, as origin and end, provide openings for thinking the forces and futures of what I will be calling *geological life*. That is, a contemporary form of life that is historically indebted to the mobilisation of fossil fuels and through that mobilization is poised to become a geological agent itself in the nomination of the Anthropocene (Cruzen 2002).

One set of fossils is the prehistoric hominids—ancestral fossils[2]—whose recent discoveries in conjunction with new technologies of dating and sequencing of mitochondrial DNA (mtDNA) have radically disrupted accepted narratives of human history and theories of human evolution in Human Origins Theory (HOT). These recent finds that I will speak to below have

upset the long held notion that humans are all human, in the sense of all humans having a shared genealogy, biology and evolutionary path. These new fossils narratives promote an understanding that there are geographical and biological differences, not just in patterns of migration, territorialisation, but in genus (and that those differences in genus are coupled with forms of territorialisation[3]). In a strangely subaltern move, fossil finds and DNA analysis are generating new genealogies that suggest the human that we have become has no "we" at the level of genus, or in terms of racial, sexual or geographic identity. The human as a shared genealogical corporeality is not as it once was. This is not to suggest that one origin story can be substituted for another (Gamble 2007), and that DNA analysis is not problematic, merely to suggest that understandings of human identity at the level of genus are shifting.

The other set of fossils is the spectre of the human as fossil that is *to come*,[4] which is implied in the imagination and materiality of the Anthropocene or "The Age of Man." Here, the narrative of geology that is being mobilized in the Anthropocene seemingly pulls in a different direction to the proliferation of differentiated human origins to suggest that the earth is a great leveller that lumps all humans together as a collective trace or strata. The Anthropocene highlights a point at which our imagination of scale, our conceptualisation of the horizon or frame of temporality shifts into the geologic. It bids us to imagine ourselves as geomorphic agent and see our practices/ways of being as geological rather than biological per se, representing a shift in terms of material production and body politic of the human. As a geological agent, humans are explicitly located alongside other earth and extra-terrestrial forces such as ice, meteorites and super volcanoes and smaller, but no less effective geologic counterparts, microorganisms. Consequently, such geomorphic force also denotes the power of extinction, planetary and atmospheric effect.

Both these aforementioned fossils,[5] as narrativistic devices for the material and temporal dimensions of the human and as geologic evidence for the beginning and imagined endings of human time, are implicated in how the human is thought in anthropogenic climate change, in terms of:

1. Forms of life (modes of subjectivity as universal or bifurcated; "Man" as the dominant signifier for the human; modes of geologic corporeality)
2. Forms of responsibility and inheritance (in a genealogy of concepts of the human and the propagation of these forms into the future; the composition of geologic life)
3. Forms of territorialisation and geomorphic transformation of the earth (as resource, ground, collaborator)

This paper is divided into two parts: Part I is a conversation between fossils past and fossils future, and the genealogy of forms that are begot betwixt the two. I will discuss how origins are implicated and conserved in the forgotten strata of endings in order to argue that new research in HOT may well be instigating the collapse of origin stories into endings. These new origin stories possess the possibility to dissolve the end, or at the very least to reconfigure it and disturb its reality so that other generative possibilities might be considered.[6] From the bodies of fossils past and future, Part II moves into a discussion about the geologic ghosts of the present in order to tease out the corporeal work of fossil fuels within collective forms of geologic subjectivity and modalities of life. Here, I will ask, what does it mean to *follow after* fossil fuels and climate change? How does this *following after* reconfigure understandings of responsibility and agency? Finally, I will consider how it might be possible to move to a fuller understanding of the gifts of fossil fuels (as a corporeal inheritance) so that

we might, after Felix Guattari, establish new gift economies that make transversal cuts into our current forms of geologic life to take climate futures elsewhere. This move away from fossil fuels, I argue, requires the development of ways of theorizing the agency of dead matter, its interests, forms of collaboration in the modalities of contemporary geologic life. As well as modes of accounting for how matter organises life in ethico-political understandings of fossil fuel use.

1.1.2 Origins and endings

'in order to watch over the future, everything would have to be begun again' (Derrida 1994)

Fossils speak to and raise questions about human genealogy, inheritance and modes of future and past survival, and thus they are a material form that provokes thought to travel along the cusp of a geologic corporeality, that is at once geologic, biologic and social in its composition. De Landa reminds us that the origins of our bodily composition are a form of mineralization that is always on the threshold between the biological vitality of bone and the dead matter of the fossil, and ready to cross back into the geologic record a moments notice. He says:

> 'In the organic world, for instance, soft tissue (gels and aerosols, muscle and nerve) reigned supreme until 500 million years ago. At that point, some of the conglomerations of fleshy matter-energy that made up life underwent a sudden *mineralization,* and a new material for constructing living creatures emerged: bone. It almost seemed as if the mineral world that had served as a substratum for the emergence of biological creatures was reasserting itself, confirming that geology, far from having been left behind as a primitive stage of the earth's evolution, fully coexisted with the soft, gelatinous newcomers. Primitive bone, a stiff, calcified central rod that would later become the vertebral column, made new forms of movement

> control possible among animals, freeing them from many constraints and literally setting them into motion to conquer every available niche in the air, in water, and on land. And yet, while bone allowed the complexification of the animal phylum in which we, as vertebrates, belong, it never forgot its mineral origins: it is the living material that most easily petrifies, that most readily crosses the threshold back into the world of rocks. For that reason, much of the geological record is written in fossil bone' (De Landa 1997, 26-7).

The remembrance of our geologic mineralogy that De Landa unearths is an origin story that is sedimented into human corporeality, but rarely acknowledged in work that takes a vital biological or social body as its primary subject (that is, life understood as the mover, shaker or taker of matter). The geologic is more often than not a forgotten strata in our becoming. As such, the fossil unearths the process of sedimentation that accrues around and is historicized within the concept of the human, while also reminding us of the *longtime* of our geologic life and our inhuman origins. This geological movement across bone into earth that happens at the threshold of fossilization names the reciprocal processes of inscription that marks the earth and bodies as concomitant territories. The assumption is that the something of one passes to the other, but that this crossing is a one-way street, where death enacts this conversion to fossilize, and thus be the agent of the threshold and its actualisation. But what if the relationship has other paths? In which the geologic criss-crosses corporeality not only to make fossils *per se*, but to mobilise specific forms of life (fossil fuel life), and in doing so, directs bodies and concepts with its reservoirs of matter-energy?

Fossil bones are tiny fragments of a larger process of mineralization that represents both the taking up of minerals and the hardening of forms in the death of bones and their disintegration back into the geologic dust that constitutes the material composition of the bulk of the earth.

Both these movements across time and becoming suggest the possibility of inhuman origins; but it is also a movement that tears time and becoming apart, shattering an originary body into fragmentary pieces so that any archaeology is impossibly speculative at best and deeply prejudiced at worst. The fossil is like something thrown far into the earth with no sense of reception: Who will pick it up? What ground will unearth it? How will it break the surface of our understanding? Similarly, the fossil thrown up out of the earth by digger, heavy rain, or ice age is incongruent to the present environment. To imagine ourselves a fossil is to become the body/thing that is abandoned to time and given over to the chaotic churnings of the earth. Implicit in this imagining is a model of the earth as strata: vertical rather than horizontal territory; intensified by the passage of time; in layers that press hard on the possibilities of forms that become fragmented in time and material integrity. The fossil then is an abandoned being that suddenly in the midst of the present reconfigures the possibilities of times, of past and future,[7] and like a line of flight thrown from some prehistoric world it offers a hitherto unimaginable direction to thought and becoming. This is the temporal and spatial scene in which fossils speak.

The fossils I want to talk about here, then, are something like an ancestral statements in so much as they are not just bones in a long line of bones (the material remainder of life forms), but they have a mythic dimension, caught up as they are in origin stories and endgames, in the making of notions of history, futurity and identity. My contention here is that the contextual tie of human origins is crucial to understanding the deployment of the "human" within the climate futures, which permeates the phenomenon of climate change, its orders of time, scientific and social practices, and its modes of exclusion and excess. As a narrative of imagined endings, the Anthropocene brings to the surface questions of origins, because everything that is found in the end must also be found in the origin for the concept to be coherent. As Elizabeth Grosz says: 'In other words, an origin never could infect an end unless

it wasn't simply or even an origin, and an end is always implicated in the origin that it ends' (Grosz 2003, 142). Origin stories are always mythic because they posit a beginning of time that is outside of itself, in the sense that it is a *monotime* that is outside of the flux and continuance of change—outside, as it were, the passage of time.[8] An origin is presented as a location that is immutable to the narrative that it begets and thus it can only collapse when the concept it carries collapses too. There is no going back before it, so any posthumanist account that wants to move beyond the humanistic binds it carries into the future must attend to its origin stories. To become posthuman, as it were, means also to become prehuman. As Grosz argues for in *Becoming Undone* (2011), 'A new humanities becomes possible once the human is placed in its properly inhuman context' (Grosz 2011, 21). That is, to discuss 'what is before, beyond, and after the human: the inhuman, uncontainable condition of the human, the origin of and trajectory immanent within the human' (Grosz 2011, 11). By acknowledging the formative role of human origin stories and how they constitute the human as such (as both social, corporeal and geographic body), the possibility exists to think the emergence of forms of posthumanism that are not dodged by a unitary human that is buried in the geologic strata of human becoming.

While origins may be forgotten, and human endings seem far-fetched, evolutionary models and imaginations of the human as a particular form infect the present in the framing of the human in the climate sciences (human factors, adaptation practices and policy, notions of imaginable or attainable futures)[9] and as geomorphic agent to come (the human as located on a trajectory locked in to fossil fuel consumption). The fossil forms the material and discursive knot of these origin and ending stories. The survival of ancestral traces becomes productive of the interiorization of others within the "we" of *Homo sapiens*, laid down as a prehistoric strata, a kind of *before* history that "grounds" contemporary *Homo sapiens* within the lineage of the earth (a process that naturalises humans to every continent except Antarctica).[10] This

grounding has a double action of burying origins within the prehistory of the concept of the modern humans so that these origins become taken for granted (as the "we" of humanity) and naturalising this particular formation of the human as endemic to the earth (as a being entitled to a global geography).

The fossil is of course an asymmetric knowledge object, a tiny bone record of a much larger life that has moved on without trace. Nonetheless, it has power[11] precisely because it is a trace-like entity, a fragment that provokes narrative constellations that shift the understanding of our becoming within orders of things. The question of the human as it is currently posed as one associated with precarity has arisen now in the context of global environmental change precisely because this ground that naturalizes the entity of the human has lost its perceived stability—the earth is no longer *pregiven* as a permissive earth—tying the human with the earth into the future as a precarious concept that is subject to dynamic earth processes and agent of them. That is to say, both these aforementioned fossil disruptions (fossil past and fossils future) suggest a need to re-think the coherency of the human as a territorializing force of the earth in both its prehistoric and future-orientated incarnation. As such, human fossils can be thought of as a mobile citational object with the ability to bring new texts into existence, suggesting new lines of flight while simultaneously overwriting previous forms of geological indexicality. Ancestral fossils, then, are always involved in a passage of becoming and unbecoming human, of suggesting new interiorities and anteriority's of what the human *is*. These fossils have a duration that exceeds their prehistoric beginnings to write new futures.

1.1.3 Fossil No. 1: The Anthropocence, the human fossil *to come*

The framing of humans as a geological force, what the philosopher Michel Serres has referred to as the 'plates of humanity' (Serres 1995) creates a geologic corporeality for humans as a collective surge on an inhuman scale. This framing has two effects on the production of subjectivity: to name humans as a collective (defined in terms of population) and to place

humans *into* geologic time. Firstly, as a collective of geologic dimensions, the Anthropocene[12] defines human impacts as a singular undifferentiated force, often termed the "problem of population."[13] With population as a key issue in modelling climate futures, demography as a geographic discipline has returned to the fore in climate discourses, along with Malthusian-inflected notions of limits and carrying that were popular in the "first" modern environmental crisis of the 1970s. In turn, the demographic framing of climate change has spawned a concern with reproduction. One example of this "concern" has recently reinstated women as one of the operative sites of control through reproduction, specifically in developing countries. Educating women in developing countries is now cited as one of the silver bullets of population control in the reduction of carbon emissions. And while it would be churlish to disagree with the education of women as an ethical concern, the siting of responsibility for climate change in the bodies of women—as a site of carbon management—in developing countries needs attention because of the ways it obscures issues of attribution, consumption and responsibility. So while the unitary geologic frame of a collective body of humans seemingly dissolves borders and differences, it nonetheless poses the problem at particularly sites that in the aforementioned example are often gendered and geographically bifurcated along the lines of Global North–South.

There are clearly no neutral narratives around how we place the human in our understanding of climate change – long before "the human" became an explicit area of concern in climate sciences, humans were already framed in particular casual ways in "human dimensions" and "human factors" research; as both recipient and cause of climate change, driver and driven, caught between the twin poles of population and individuation. The human of climate sciences comes after the earth (in modelling terms) and as such, earth systems science sets the terms for its incorporation into climate change as quantifiable subject, subject to quantitative

reprogramming and behavioural readjustment. This subject formation is due to the late placing of humans into climate change models in which they become an *effect* of the modes of organising the physical geography of the earth, as well as the various forms of futurology that characterise the science-policy interface of climate change that *require* a unitary human.

As a temporal device that shifts perspectives, the fossil of the human to come is in the same class of climate objects as the ice core, but what is different is that it is an object that has collided with its spectre to provide its own haunting. The Anthropocene as a concept has a double action of settling this anthropogenic climate event into the ground of multiple past climate events and thus bringing human impact to attention on a geologic scale, while simultaneously locating the human in a temporal horizon that is characterised by a succession of biotic extinction events and abrupt swings in climate. As Bronislaw Szerszynski comments on this double bind: 'the very notion of the Anthropocene contains an element of indecision: is this the epoch of the apotheosis, or of the erasure, of the human as the master and end of nature? Just as the liberation of technics from the human, while it founded the human, in the same gesture also threatened to make it redundant, so too today does the final victory of human civilization over nature seem to threaten the human – and not just ontically, but also ontologically' (Szerszynski 2010, 16). Wryly, he suggests that 'Perhaps our only choice is thus which kind of extinction of the human we are prepared to let happen: an ontic or an ontological one' (Szerszynski 2010, 17). But the question is not just of a singular ontology of the human in which "we" all share, but can more problematic be posed as a question of ontologies, of different forms of geologic life that have ontic implications. In its appeal to a common fossil trace, the Anthropocene mobilises and naturalises a universal subject, "Man" that is the foundational subject of humanism. [14]

The appeal to singular ontological origin obscures gross differences in responsibility and attribution and forms of geologic life (from high intensity fossil fuel consumption to organic fuel consumption), while mobilising what Tariq Jazeel calls 'a litany of stultifying 'pre-critical geographic givens' in which 'planetary yearnings normalize universality *as* an extension of Eurocentric modernity' (Jazeel 2011, 78). As Jazeel concludes, 'This planet *is* the ground that unites humankind, a geo common to all, but one that can only be glimpsed through moments of willing transcendence of that ground' (Jazeel 2011, 80). This transcendence, about, beyond, outside of the earth is a messianic move—the god trick—that eradicates space and time, while, with the sleight of hand that technology allows, reinstates that transcendental moment with a particular signature of territorialisation, in its most dramatic instance, the Apollo space photographs as a achievement of the U.S. Cold War techno-military complex that created nature as a subject of cultural accomplishment. What is important to note for this argument, is not so much the transcendence nor the geo-piety (Jazeel 2011, 89) that ensues, but the way in which the *geo becomes a collaborator* in particular formations of subjectivity, while simultaneously appearing as a benign entity that can be taken for granted as neutral (or neutered) ground or as a geographic pre-given common to all. While seemingly neutral statements of geomorphic effect, these images and imaginaries of geologic life in the Anthropocene actively campaign on our senses for a particular political scene in which specific forms[15] of subjectivity emerge that might be called modalities of *geologic life*.

In the most straightforward of ways, climate change then narrativises a new materialism that is *geologic* in the coupling of *Homo sapiens* and fossil fuels into a trajectory of geologic mobilization at the level of the genus. To even imagine the Anthropocene at all, we must become *fossils*—seeing ourselves as the material remnant of an event of life that has passed

into the earth. Or we must become the posthuman spectator of the remains of the human. We must also place ourselves alongside other fossils as an iteration of life's expenditure, *one among many*, the fossil remainder as geologic witness. In his recent work, *Malfeasance* (2011), Serres takes the plates of humanity metaphor further to argue that humans have laid claim to the earth through their pollution, both hard pollution—the poisoning of the earth—and soft pollution—the pollution of our subjective life. For Serres we are an animal that claims geography through our excretion, our defecating prowess and the force of our wasting. As both fossil and waste, geologic life begets ghosts and remainders that might yet shed light on the processes of geologic inter-corporeality.

What has lubricated and enabled this passage to collective geomorphic force is the material *reanimation* of another extinction event. One trajectory of extinction feeding off another. Dead matter—dead organisms of oil, the biogenic and thermogenic organic matter of gas, the carboniferous plant matter of coal—animates human life, becoming live matter again, reanimated in the engines of the Anthropocene. These fires of combustion that underpin modernity—the energy, the heat, the vital materialism—are irreducibly part of what it is to be human in this moment. These material worlds are not outside the text of the human, but agentic within our reproductive, creative and technological possibilities. As Szerszynski comments, 'If our carbon metabolism is undermining the very stable climate that made human civilization possible, perhaps also at risk is the specific semiotic *dispositive* of the human that was at the heart of that metabolic regime' (Szerszynski 2010, 17). This humanism built on dead matter is not just a materialism that underpins particular cultural forms or practices, but biological forms expressed through reproduction at the level of populations[16] and the subsequent expansion of human populations into all living and nonliving forms of the earth. To say there is a close relationship between demographic evolution and the use of fossil

fuels is not to invoke some sociobiological explanation, akin to the climatology of colonialism or explicitly racist narratives that it satisfied (although these are becoming increasingly evident in climate change discourses), but to acknowledge a material condition that is inextricably linked to our becoming, as the warmth of the "Happy Holocene"[17] is to our surviving at all. Biodiversity loss in its most simple expression is the consequence of this human population expansion and the battle over geography that has ensued in securing of the material conditions for the reproduction of life in its modern geologic forms.

Second, the immersion of modern humans into geologic time suggests both a re-mineralization of the origins of the human and a shift in the human timescale from biological life-course to that of epoch and species life (this is most evident in the future generations narratives within climate change discourse and ethics). The contemplation of the longue durée of climate is a reminder that climate change is not an exclusively modern event and something that has an ancestral trace (evident in human evolution), although its form as a human-earth collaboration *is* a modern actualization. The ancestral trace that survives in the composition of modern humans today suggests that "we" not only *follow after* climate change, in so much as it is a forgotten strata of human becoming, but we also *follow after* the fossil fuel materials that gift the potential and provocation for geological force (not to mention geopolitical force).

Thinking ourselves as embedded in geologic temporalities and materialises has the potential to release some of the narrative trajectories beyond the narrow confines of our humanism into inhuman beginnings and beyond our biological materialism into thinking better with geologic materials. This is to say that "our" geologic force is not ours alone and owes a debt (of force) to the mobilization of another geological material, that of fossil fuels. To focus solely on

"Man" in the Anthropocene marginalizes the material openings that make such geologic forces possible in the first place, and anthropomorphizes the geological without paying sufficient attention to the temporal and material logic of such a scene.[18] Prioritizing ourselves as a species within the generation of meaning and material effects while minimising the force of fossil fuels in organising forms of life, fails to properly acknowledge the agentic power of fossils that fuel this equation. This failure has consequences for how the relation to fossil fuels is thought in terms of subjectivity and practices. I will return to the collaborative mobilisation of geologic materials later in the paper, but for now, one of the questions that is little asked in the context of the Anthropocene is how contemporary humans *follow after* both climate and fossil fuels in the generation of geologic force. The answer to this question has an inhuman context.

1.1.4 Fossil No. 2: Human Origins, rewriting the geologic record

Writing the geological record from the fragments of fossils is marked as an im/possible project that is subject to possible revision with every unearthing of new fragments. However, until 2010 the origin point of Human Origins remained fundamentally conserved. As the *American Museum of Natural History* puts it; 'After several million years of human evolution, only one hominid species remains: *Homo sapiens*. We have spread across every continent into a wide range of environments—and in the process, minor differences between people living in separate regions developed over the course of thousands of years. As a result, humans today have a variety of skin colors, body types and facial features. But studies of human DNA reveal that all humans are remarkably similar—we are 99.9% genetically identical.' (http://www.amnh.org/exhibitions/permanent/humanorigins/species/) And the Smithsonian; 'One Species, Living Worldwide The billions of human beings living today all belong to one species: *Homo sapiens.'*

(http://humanorigins.si.edu/resources/multimedia/videos/one-species-living-worldwide). Such confident statements of "one species, one world" have been significantly revised in light of recent genomics research and new archaeological finds, which have instigated a profound opening up of the human as a biological and geographical concept. From a singular origin—"Out of Africa"[19] —and, singular species—*Homo sapiens*—the genus of the human is rapidly becoming otherwise. Headlines abound in the science journals about how recent DNA profiling is rewriting the story of human origins and thus the concept of the human to boot. As geneticist Michael Hammer puts it, "We need to modify the standard model of human origins" (Hammer 2011).

Up until 2010 *Homo sapiens*[20] were considered the "last human" in a genealogy of another 22 other hominids that had gone extinct. The existence of the fossil record of the "Other 22" (Sarmiento et al. 2007) suggest that "we" as a singular genus were the biological remains of our species, the last of our genus that somehow survived that which others could not. This progressive narrative of successful evolution as it has been repeatedly told, has been complicated by the Lazarus effect which genetic research is enacting in the detection of genetic contributions from archaic forms of *Homo* from outside Africa to anatomically modern humans. As it turns out, many of the "Other 22" did not go entirely extinct and we are not quite whom we think we are. There was always something quite sad about the narrative of "our" sole survival. The living on while all the other hominids failed. While the survival of *H. Sapiens* has been variously narrated as a heroic tale (Gamble 1993, 4) and as a proof for humanity's exceptionalism, the failure of the "not-us" as part of our origin story also names an *inability to catch sight of the other*; to give space and imagination to the possibilities of an/other radically different and anterior/interior to us. This failure of the imagination also

speaks to a desire to have a self-sufficient subject that is in no way complicated by that which exceeds or precedes it.

The biggest science story of 2010 was the sequencing of Neanderthal DNA, and the answer to the long asked question of whether humans and Neanderthals got it on (the answer is that they did) (Burbano et al. 2010) (Green et al. 2010). As Paleobiologist, Clive Finlayson subtly puts it; 'Put together, this evidence shows us that humans formed an interwoven network of populations with varying degrees of gene flow between them. Some humans may have looked quite different from each other, revealing a combination of adaptation[21] to local environments and genetic drift, but it does seem as though those differences were not large enough to prevent genetic interchange' (Finlayson 2010). Alongside the proclamation that "we are all Neanderthal now" (Neanderthal contributes up to 4% of modern Eurasian genome), other stories have also emerged of the Neanderthal as a carer for the disabled and elderly relatives, a plant eater, but probably most importantly, as a victim of climate change rather than interspecies competition.

Cro-magnon man has always been defined in opposition to the Neanderthal man as a superior being who survival is narrated as a testament to various cultural and biological *powers* of overcoming (Finlayson, 2004; 2009). The Neanderthal, in contrast, was the non-survivor who failed to become of the future (or so it was thought), despite weathering 200,000 years of the most intense period of climate change. Ridiculed and denigrated as a counterpoint to "our" becoming, the Neanderthal's primitive prehistory provides the oppositional ground in which Cro-magnon's becoming was mobilized. Like many theories of race (that were historically contemporaneous with theories of human evolution), superiority was operationalised through the denigration of another's difference, where the primitive other is paradoxically necessary for the logic of the former to be what it is. As Neanderthal man was once posited as the oaf of prehistory, Cro-Magnon man is becoming a self-made man of the climate era and as such

there is increasing attention to adaptability and innovation in human origins research within the context of climate change (Stringer and Andrews 2005:228). Popular science writer Brian Fagan suggests; 'Cro-Magnon captures the protean adaptability that has made humans an unmatched success as a species' (Fagan 2010). My point is that the concept of the modern human holds towards the Neanderthal, so that when we become part Neanderthal, this tension collapses and the ascendency of Cro-Magnon man collapses in contamination between the two hominids.

The second major discovery in 2010 was that of "X-woman" who was reported to be a possible new species of human' (24 March 2010 *New Scientist*). An article in *Nature* proclaimed that;

> 'The ice-age world is starting to look cosmopolitan. While Neanderthals held sway in Europe and modern humans were beginning to populate the globe, another ancient relative lived in Asia, according to genome sequence recovered from a finger bone in a cave in Southern Siberia. A comparative analysis of the genome with those of modern humans suggest that a trace of this poorly understood strand of hominin lineage survives today, but only in the genes of some Papuans and Pacific islanders' (Callaway 2010).

While the previous discovery of 17,000-year-old *Homo floresiensis*—dubbed the "hobbit"—had dispelled that notion that there were no other species of hominids that existed contemporaneously with humans, many archaeologists looked on *H. floresiensis* as an anomaly, isolated from the *H. Sapiens–H. Neanderthalis* hegemony. X-woman and her Denisovan kin folk (Denisovans contributed around 4-6% of modern Melanesian genomes)

suggested that multispecies living and polymorphism may have been more prevalent than is given by the nomination of a singular genus of hominid (Berger et al. 2010).

The other major area of revisionism in the human origins story has been in the area of territorialisation and migration. DNA sequencing of the hair of a young aboriginal man, which was sampled from a "gift" given to a British official 100 years ago suggested the duration of territorialisation of Aboriginals in Australian was much longer than previously thought. A research paper in *Science*, "An Aboriginal Australian Genome Reveals Separate Human Dispersals into Asia" (Rasmussen M, et al. 2011) argued that this dispersal was possibly 62,000 to 75,000 years ago and that it was separate from the one that gave rise to modern Asians 25,000 to 38,000 years ago. Their findings put forward the hypothesis that present-day Aboriginal Australians descend from the earliest humans to occupy Australia, likely representing one of the oldest continuous populations outside Africa. One thing that such an occupation suggests is the need for responsibility towards recognising the intensification of territorialisation over the longtime.

These recent "discoveries" in HOT have reconceptualised the human as potentially interspecies and beyond a singular hominid species. This in turn, has upset the idea of human becoming as formed from a linear line of descent and a singular "Out of Africa" moment, articulating instead that humans are differentiated, temporally, sexually and geographically in their migration and forms of territorialisation (Gibbons 2011, 392). The various new hominid alliances are neither conclusive, unproblematic, nor unmediated, but yet they do suggest a loosening of the forms of human and a querying of its auto-reproduction into the future.[22] The idea here is not to take one origin scene and replace it with another, rather to point to the indeterminacy that is bound up with trying to read a past *in* the present *for* the future. The

querying of long-held views about origins and identity in HOT and the troubling of assured modes of reading the human is enough to open up the human to other radical possibilities in terms of its composition (biological, racial, cultural, geological), without reinstating the deductive powers of genetics. What this diffraction achieves is breaking the unity of a singular picture of the human, shattering the plane of an originary and unmediated condition.

2. Dis/Locating the Human: unravelling the Universal, collapsing the Human and building collectives

If "Man" as unified and hierarchical signifier of human life starts to disintegrate as a stable concept and identity, do the possibilities for climate futures change and begin to open up to other forces? If the origin conserves itself in the ending, must the prehistoric be *given* in particular ways in order for anticipatory futures to unfold in the ways that they do? If the contention is that origins beget endings through the conservation or maintenance of the origin in the narrative arc, then the naïve question of what is *in* prehistory that *allows* the "Age of Man" its unquestioned trajectory into the future needs to be asked. What has been *in* prehistory until recently, I would argue is a narrative of a commonly shared evolution and species-being, so that the notion of humankind has somewhat unproblematically been tied as a collective with a shared inheritance, "Out of Africa"[23] and an autonomous agency that takes survival as a guarantor of self-sufficiency. What kind of differentiated beginnings[24] would a prehistory need in order to release nascent modes of subjectivity that resounded with difference and non-selfsufficiency? (Nancy 1997; Bradotti 2010) And, in which climate is not narrated as simply another sphere of operability (for geo-engineering, green economics, disciplining subjects, autoreproduction), but as a compositional geological condition that grounds and un-grounds differentiated forms of becoming?

Rather than any natural form, the concept of the human is an ethico-political concept that at present refigures modes of universality that erase important differences and elide the asymmetries of unequal responsibility. Under the sign of the human "we" all become equally responsible for the world, yet are not all adequately represented by that sign, which remains marked by Western-centric, technocratic, patriarchal, imperial[25] and normative productions. The conditions under which the human becomes a concept and descriptor of collective being have ethico-political implications, the most important of which, I would argue is that in the action of placing together that which is apart. In that movement there is a simultaneously eliding of the hard *work* that needs to be done to come together as a collective within a politics of the earthly commons that is not built on violent exclusions or forms of hierarchy that reproduce existing power structures. The *work* that I refer to here is both the work of cohabitation with human and nonhuman others and the work of *tying the tie*[26] of social and planetary relations. It is no small project and this *work to come* cannot be presumed or substituted for the appearance of universality that global imaginaries offer. Furthermore, building such communities is not about consciousness building *per se*—a campaign for the better visibility of the earth within politics, as the visual politics of environmental campaigning often suggests—but, I would argue, requires an understanding about *how* the earth (as object and matter) is a deployed in particular cultural forms, often as a hegemonic force that violently effaces differences, while appearing to be a *neutral* common ground.[27] How the human-earth assemblage develops concepts of human, nature and temporality in concert and in seemly collaborative ways, while masking the genealogy of these forms and their narratologic formations is a question that still remains to be asked in the context of climate change.

My argument here is that the universality of "Man" that underpins the human as the

foundational ground of humanism is connected to the concept of earth, but it is necessary for this "Man" to fragment before the work of any politics of the commons, which climate change might allow (and require) can begin. That is, the precept of the human that is man, has been the pre-established condition for thinking about climate change, and thus underpins the formation of the subject of climate change. If this "Man" is dislocated, his origins queried, there is the possibility of unleashing new forms of subjectivity to think with, and new geographies and modes of being that might be carried forward into futures.[28] Part of the necessity for this dislocation, I would argue is to acknowledge the excess of the concept in two important ways; Firstly, the excess of exclusion; Secondly, the excess of relations that go beyond existing accounts of entities and point towards multiple productions of subjectivity between entities, that is between natures, between geologic and biological life and between times. In order for the human to maintain its trajectory as coherent, it has to maintain its origins as iterable, so that even if they are forgotten, an ending or future can be secured in which the universal is conserved. Grosz suggests, 'Iterability requires the origin to repeat itself so as to have the value of origin, that is, to conserve itself…The iterability inscribes conservation in the essential structure of foundation' (Grosz 2003, 107–9). The unravelling of human origins into a rhizomic pattern of differentiated lines of flight releases a non-unitary vision of the subject whose yet-to-come is as divergent as the forms of geologic life that are inhabited and propagated into the future.

Underpinning this argument towards an understanding of geologic life is the contention that the concept of the human and forms of human becoming have significant implications for how we think about: human-nonhuman interactions and extinctions; interaction between living and dead matter in the mobilization of fossil fuels; climate change adaptation[29]; and forms subjectivity (universal or non-unitary). Furthermore, thinking beyond our present

circumstances, be it to our imagined climate futures or prehistoric pasts, is also a call to be present in the perpetual possibilities of the universe. Hence, it is not just the world before and after us that should concern us, but the way in which these expanded imaginaries (or aesthetics of existence) also offer us the ability in the present to think the possibilities of the universe to be otherwise (Grosz 2008). *But what kinds of ghostly appeals do these imaginaries of human fossils make to the understanding of nonhuman and inhuman origins? How do we speak, as Derrida would have it, to the ghosts of fossil fuels future and its spectral predicament? What kinds of deadly inheritances do we sign on for in this experiment with the fossil fuels dead?*

The human fossil in some ways tells us what we already know—that we will return to the earth—but it also tells us something new about our geographic reach through time and space and queries forms of responsibility across temporal and spatial horizons. That is to say very little about the precise forms of recombination of materials that climate change enacts, but what I want to speak to here is to the new ghosts that have entered the scene, which make Derrida's question of 'Whither tomorrow?'[30] an ethical question that must reach into its inhuman origins and endings to talk with the spectres of both past and future fossils if it is to speak to questions of justice at all. This generates three key theoretical questions:

> *1. What would a philosophy look like that takes account not only of a nonhuman corporeality and forms of becoming with, but also takes account of our inhuman origins; that is the corporeal dimension of fossil fuels or geologic life as* constitutive *of inheritances and futures?*

2. What kind of deterritorializations are necessary to make it possible for "Man" to be released from a genealogy of exceptionalism and to find herself between natures in the art of becoming otherwise?

3. How might a radical posthumanist account of the earthly (k)nots of relations look to its own undoing as a necessary pre-condition of the possibility of coming to terms with the modalities of geologic life (such as climate change and fossil fuel-ism)?

2.1.1 Man's Place in Nature

The question of "Man's Place in Nature", as Thomas Huxley posed it in 1863 in the context of fierce struggles over evolutionary theory and the location of the human in both space and time, haunts the Anthropocene. Although differently formulated, as "Locating the Human in Climate Change," "Human-Environment Interactions" or "Climate Change and Society", the question remains remarkably close to Huxley's iteration in its formulation of Man as a universal, unitary concept that is distinct from Nature (with a capital N) and whose condition is defined through the importance of geographical location in time and space. That is to say, "Man's Place in Nature" is posed as a metaphysical question that has a geologic resolution. As the conceptual nomination and materialist manifestation of a geologic era makes clear, "The Age of Man" is inextricably tied to notions of geography, its spatial and temporal imaginaries and forms of becoming. While concepts of man draw on particular imaginaries and materialities of geographical space to establish their foundational ground[31] and scope, this ground has been invoked as a geopolitical territory that emphasises the political over the "geo". Climatology, the study of climate, derives from the Greek, *Clima*, meaning "place zone" suggesting that placing and locating the human are related to questions about the spatialities and temporalities of earth histories, as much as they are related to questions of socio-political construction of climate. And rather more than this, *geologic life* as a subject of

politics, of control and governmentality is emerging in new forms such as geoengineering, the regulation of carbon metabolisms, petropolitics as well as being thoroughly sedimented in the geopolitical organisations of fossil fuel acquisition, conversion and consumption. All of which demand a more nuanced understanding of the work of the *geo* in the composition of politics.

A cursory glance at the historic geographies of locating man within the earth ties the concept of man through particular places, which often seem to offer persuasive empirical grounds for new theories. The "One World/Whole Earth/Earthrise" moment (and its various recurrent instances in anthropogenic climate change) is one such case of seductive ocular expansionism that offered the spectacle of a Planetary Holism, while subsuming difference into a unitary "Nature", bifurcated only by the demonstrative lines and patterns of culture or political space (Cosgrove 2001; Jazeel 2011). My point here is that the concept of man territorialises the earth in particular ways, so that to even begin to examine how me might take up a critical position or move through the humanism, universalism and phallocentrism that the Anthropocene proffers, an account of earthly relations is necessary in concert with any account of the human; in which the human is understood as neither a sociological or biological entity that is pre-given in any sense, but an entity that emerges at the threshold of intersecting narratives and material-energetic earth practices. So, the *geological life* that I refer to here, which forms the scope of this paper, is at the intersection of cultural forms, sexual difference and geological/geomorphological processes, including climate.

Firstly, I want to make an argument, following the work of a number of feminist scholars that the human in its present form is an inappropriate concept for dismantling the radical asymmetries of global power, human-earth relations and multispecies being; that is, because it

is a concept that covers both interior and exterior challenges of difference, in force, agential power, sexual difference, inheritance and species-being. Furthermore, the concept of the human masks the specific context of its emergence and conditions of production. Secondly, I want to suggest that rather than abandon the human on the shores of a dynamic earth, it might be possible to pass through the new rhizomic beginnings that human origins research is suggesting to speculate on a future human that might be able to yet survive its own humanity: *a speculative humanism*. That is, that rather than move to a position of alterity from which to critique the manifestations of the human, I want to stay within the text of the human to extract new contours of the entity that is the human in the space between its natures—a de-centring of the human that problematizes its current forms of intelligibility. This rhizomic tale of origins is not about the promotion of difference *per se*, but in its simplest expression is about the collapse of an origin into an end. Now that the narrative of the Anthropocene are corrupted this allows for a thinking that goes beyond the confines of the particular forms of humanism that was its subject. Put simply, the collapse of a one species, one trajectory origin story raises the possibility of thinking outside of an undifferentiated model of the human that was raised under a patriarchal signifier. If the "Age of Man" collapses in on itself, how does the subject of that conceptual arc have other possibilities and manifestations? What origin stories do we need to dream up then to rethink futures in the ruins of Not-Man?

I want to argue that the *human as fossil* and the temporal, material shift that this imaginary pre-supposes might just provide a cusp of sensibility that travels along the alterity of the concept of the human, enabling a perspective on the differences situated beyond the concept of "Man" and its exclusionary humanism. This speculation is done within the understanding these new genealogies of the human that are emerging in HOT (discussed earlier) are every bit as mediated and problematic as their contemporary relatives. Thus, my intention with an

engagement with forms of geologic life is not to naturalise a new concept of the human within the earth, but to think with the possibilities of becoming otherwise, on not becoming "Man" into the future through these human fossils and remainders.

2.1.2 Inheritance and responsibility: Talking to ghosts

What does it mean to move against the human that is named in the "Age of Man", the very Man that has supposedly survived against the odds through older climate events? What does it mean to abandon this human and declare it as not having survived at all? Or, rather to declare other survivals within the genus of *Homo* that proliferate the hominid lineage? This is an inheritance that is now complicated by other beginnings and endings and non-unitary forms of human life that complicate any simple origin from which a "we" spring and from which "we" can assume as common ground. If we no longer inherit these origins as a collective, the name of the human turns against itself, its own name, to name the human to come (that which exceeds the limits of that name and is underived from a it). This new inheritance names the absence of a coherent body politic and it names the possibility of another set of names predicated on a difference that calls for a community to be built rather than assumed (see Nancy 1997).

To mobilise a narrative of human origins is to question what it is that we take forward into the future, what is inherited under the concept of the human and what survives it as excess or exclusion. This is a future always *to come* in a Derridean sense, of never being fully present and disclosed, or able to be known in its finality. Who knows what our collective experiments[32] with fossil fuels will entail, what kind of natures to come will be borne of this mobilization? Yet it is incumbent on us, before we think the "where" of the human in climate change to think what this question mobilises in terms of thinking, framing, inheriting and reproducing the world or the *worlding of the world* (Grosz 2003, 135). My point is here that

every deployment of the human in climate change policy, research or science is a deployment of a particular understanding of a relation or ontology (of being in relation) that territorializes the earth in certain ways that are historic and geographic. That is to say, that every question about the human and its origins and futurity (and its fragmentation) is also a framing of the earth and nature. What kind of nature is it that is inherited through the practices of fossil fuel consumption?

If relational geographies of naturecultures have got us far in thinking with nonhuman others and understanding responsibilities that adhere in practices and extend across lively networks, they have also perversely reinscripting forms of in accepting the priority of responsibility and situatedness, in which the *in general* or the *not-for-us* becomes less important by default. In the acknowledgement of responsibility then there is a double bind where being implicated also means being back in the frame, and perhaps more importantly, setting the temporal logic of the frame. Some feminist scholars have sought to avoid subject-based entanglements and sort a much more pronounced agential role for matter in the making of worlds. What has been difficult to theorise, however is non-productive relations, what might be called the work of the dead. It is often, then, life that is differentiating matter rather than the other way around: life is *the* force that does the work across human, nonhuman and inhuman worlds. The priority for the force of life is tempered if the geological and the matter-energy of dead fossil are given their geomorphic due. At present, accounts of the work of fossil fuels are centred on the human subjects and their practices, rather than on a thinking that allows fossil fuels their material-energetic force. That is, how dead matter differentiates life, at least in part, and in ways that exceed this or that subject, but underlie the compositional inheritance of human subjects *in general.* If matter is dead till life operates on it—life cuts matter (or the force of matter only becomes actualised within life)—then, how can we begin to explain the ways in

which we become with fossil fuels in ways that are not entirely our own, nor are driven by lively matter, but by dead ghostly reanimations and remainders? Fossil fuels are life that comes back to us, as it were, to take up new life forms. What kind of materiality is it that becomes lively within our biological and cultural practices, and how does this materiality differentiate life *as geologic*?

3. Geologic Life: New beginnings

3.1.1 The vitalist lure

While much attention in critical theory has been given to the molecular, informational and biological composition of the human and its interrelations with nonhuman others—articulated as biopolitical life—the geological composition of the human, as concept, biological entity, inheritance and territorialising force, have received scant attention, with a few notable exceptions (2011). Nigel Clark notes that, 'While there have been several decades of productive articulations with the life sciences, especially in feminist theorizing of the body, explicit engagements with a nonliving materiality remains rare. A few philosophers have lately noted, in most of the encounters with elemental matter to date, it has paradoxically been the 'liveliness' of the inorganic that has been highlighted, at the expense of properties that are more specific to the mineral or chemical structures that make up most of the known universe' (Clark 2011, 23-24). While the assumption is that it is life that is doing the work, dead matter will fall out of the equation if it is not active, backgrounded as the pre-given ground. What kind of account of matter would be needed that would allow fossil fuels their proper agency in our different geologic genealogies? An answer might be: an account that does not belittle geology's force of inscription, not to elude human responsibility, but to better understand how and where it lies. What kind of an account would begin to acknowledge the forms of unequal dependency that characterise this relation? Fossil fuels suggest another path into how the

work of dead matter (or a non-vitalist materialism). Namely, that there is some agreement or patience[33] between the dead matter of fossil fuels and the live matter of bodies that allows both life and nonlife to expand, biologically and culturally, to transform matter (live and dead) and become mobile in the world. Considering how these two bodies, of the dead and the living, touch one another (and are sensible to one another through that touching) is part of beginning to know better the traversals between natures. Grosz suggest we think of how, '[m]atter and life become, and become undone. They transform and are transformed. This is less a new kind of materialism than it is a new understanding of the forces, both material and immaterial, that direct us to the future' (Grosz 2011, 5).

What does this collaboration look like? The environmental fire historian Stephen Pyne has suggested that our pyric sensibility is hotwired into our evolution (Pyne 1995, 2000). We are because of fire, he says, not the other way around. While anthropogenic fire expanded the range of climates available to humans (Pyne 1991, 73), the intensity of flows mobilised by fossil fuels scales this expansion up to the level of the planetary. Understanding how to work with fire, not to control it, but to coax it into different forms of being in Aboriginal cultures entailed learning what the fire wants, its proclivities, its energy; this is what Pyne calls 'fire farming' (Pyne 1991, 72; Clark 2011, 172-182). If the same logic is applied to fossil fuels, what can be said about their needs and proclivities? How are we to listen to these ghosts of mineralisation that are rattling in our bones? How do these dead fossils crave the release of their force? What is it *in* this fossil biomass that is so insistent and seductive? What might fossil fuel farming entail? One way into this would be to look at fossil fuel practices (as much energy and sustainability research does), but while it is assumed that it is the subject who is in control of practices—as a producer rather than a collaborator—the particular material-agentic intensification of fossil fuels are eroded, and fossil fuels are stripped of their force. Looking at the difference in economies that are dependent on living biomass and those dependent on

fossil biomass is sufficient to indicate the extreme power of that intensification as a form of geopolitics. Similarly, in sustainability literatures, the focus is often on limits rather than the openings of what this geologic mobilization *allows* in terms of life forces and their reproduction. An STS perspective might provide a better account of the agentic properties of fossil fuels, but across a flat ontology, this might say little to geological inheritances and to the question of forces. If the aim is to leave fossil fuels in the ground, not to actualise their energetic-materiality, then it is the openings of fossil fuels to forms of power and intensification that need attention, and not just in terms of geopolitics, but in terms of the geologic corporeality that desires that intensification. After Felix Guattari, the question becomes about how to address the collective production of subjectivity through fossil fuels so that transversal grafts might be made that cut across those openings into geologic life (Guattari 1995). So that it might become possible to make a counterintuitive move, and turn against the "gifts" of fossil fuels and against the human that is its inheritance, into other energetic relations that redirect the flows of energy.

3.1.2 Dead life or "how to get up with dead things"

If the geologic is responsible for and a material directive of life forms (cultural, biological, social, political), then it seems surprising that there is no philosophy of the geologic, nor adequate conceptual tools for thinking across live and dead matter in ways that do not privilege vitalism—the work of life. The fossil unlocks this life-death, time-untimely equation, suggesting the need for an understanding of the agency and forces of dead matter within live bodies. A material corporeality that is not biological as such, but more-than-biological, more-than-vital, and able to comprehend a life after death rather than see finitude. Fossil fuels have a significant downtime in terms of vitality (about 360 to 286 million years), but it is a time of powerful transformation that packs energy tightly into matter, generating a hyper energetic-

materialism. But, during this dead time, in terms of theory—of giving an account of—this matter is conceived of as dead rather than just withdrawn into an interiority that is composing life, reconstituting it in ways that far exceed vitalist accounts of matter. That is, fossil fuels only matter in our accounts when they are productive in social worlds, which only constitutes a tiny fraction of "their" lives. If the fossil were simply "dead" why would it have such a melancholic place in culture?[34] Why would it provoke? And be central to the contemplation of life? Fossils disturb precisely because they are powerful, they still have forces that act. Fossils are not waiting for life, as it were to transform them, but they are "patient" for forms of collaboration and human tender. In simplified terms, some qualities in matter are withdrawn, not available to social relation and in terms of sensibility, flings us away. That is, difference can be a repelling force that does not just refuse to participate in the terms that are set out by the authoring centre (by "our" relational desires). It is this very estrangement, that, according to Derrida, that spurs us to relation (Clark 2010, 72). Grosz's understanding of evolution is instructive here, she argues that rather than try and find a "place" for the human—*in* Nature—she see's evolution's generative force in the indetermination of life, of not being fully at home. She says:

> 'Life can be life only because the universe, at least as far as the living are concerned, is where it is never fully at home, where it can never remain stable, never definitively know itself or its universe, control itself, its world, or its future, where it must undergo change over generations, where species must transform themselves even though they do not control, understand, or foresee how. Operating at a faster or slower rate of speed than much of the universe, life is always challenged to overcome itself, to invent new methods, regions, resources, to differ from itself… Life is that which does not fit in its ''place,'' is always out of place with the natural world though it remains part of the natural world: it is this lack of fit, this discomfit, that generates biological

> and conceptual inventiveness. Not having a given place in the universe—except that which it forges for itself—life is also out of time, not simply determinable in its time and place, but is that locus or orientation that invariably strives for a new future (Grosz 2004, 39-40).

In this account of life, the impetus to generate new forms is given by this lack of fit, the "out of place" dislocation. The relation that is posited is between life and matter, in which 'Life is not different in substance from matter but is a kind of opening up of matter to indeterminacy, a qualitative transformation of matter into the unexpected, the surprising, the never-seen-before and the never-able to-be-repeated' (Grosz 2004, 41). This, argues Grosz, is evolutions' force, a never given in advance, stage by stage confrontation with the duration of matter, 'evolution through division, bifurcation, dissociation – by difference, through sudden and unpredictable change, change which takes us with its surprise' (2005: 111). For Grosz, life is the differentiation of matter into the bifurcation of forms. The inventiveness of life is given by its lack of a given place in the universe, in time and in space, expect for its own territorializations that are always, she argues, striving for a new future. Grosz claims Darwin introduced 'indeterminacy into a previously determinable universe, and excess into a previously functional understanding of life. Life exceeds itself, its past, its context, in making itself more and other than its history: life is that which registers and harnesses the impact of contingency, converting contingency into history, and history into selfovercoming, supersession, becoming-other' (Grosz 2004, 40). Her concept of a uncontainable life that is always in excess of itself (in terms of expenditure and historically—it can never fully know itself) develops an ontological context for how to think with life not just as contained by its pasts and antecedents, but open to be more than or other than it presently is: an opportunity rather than a limit, to be 'open to and directly by otherness, by forces and energies that imply

newness and invention' (Grosz 2004, 42). While Grosz doesn't speak directly to the geological, her reframing of becoming as a kind of becoming *through* the very openness and indeterminacy (that is also precarity) of matter offers a way to rethink cultural forms as directed by the contingent materialities of the world. Contingent materiality unsettles the possibility of any pre-given place in the world, but also generates the conditions for the new, that is towards a futurity that surpass the potentialities of the present.

As such a contingent materiality, fossil fuels are interesting subject/objects in the sense that they are the dead remains of lively things that pass through a process of sedimentation to become a condensation of energetic materialism capable of transforming natural systems and biological life with a force that far exceeds human agency (while simultaneously begetting human agency force as geopolitics). That is, they are as there nomination suggests, both fossil and fuel, both deep time and dead matter, and transformative possibility. If we want to understand anything of the art of living without fossil fuels there is a need to develop forms of nonparticipation with their energetic-materialism, which entails understanding their agentic force—that is, what it means to both follow after fossil fuels and be propelled into the future with them—and, what it means to be responsible to that inheritance and attempt to refuse its reproduction into the future. Such a refusal requires a *sacrificial responsibility* that entertains the relation between the gift and sacrifice. And, it requires a move against all that we have inherited in "The Age of Man."

3.1.3 Geologic corporeality

While we continue with life doing the differentiating, by default we ignore that which is not life, and prioritise and institutionalize the priority of life. As De Landa comments, this is what he deems, 'organic chauvanism' (De Landa 1994, 103), 'that leads us to underestimate the

vitality of the processes of self-organization in other spheres of reality. It can also make us forget that, despite the many differences between them, living creatures and their inorganic counterparts share a crucial dependence on intense flows of energy and materials. In many respects the circulation is what matters, not the particular forms that it causes to emerge. As the biogeographer Ian G. Simmons puts it, "The flows of energy and mineral nutrients through an ecosystem manifest themselves as actual animals and plants of a particular species." Our organic bodies are, in this sense, nothing but temporary coagulations in these flows: we capture in our bodies a certain portion of the flow at birth, then release it again when we die and microorganisms transform us into a new batch of raw materials' (De Landa 1994, 103-4). What we can draw from being attentive to the work of forces and flows as a unit of analysis (Grosz 1994) is an understanding of how forces direct, author and allow possibilities for forms of life.[35]

Grosz insists that 'force needs to be understood in its full subhuman and superhuman resonances: as the inhuman which both makes the human possible and at the same time positions the human within a world where force works in spite of and around the human, within and as the human' (Grosz 1994, 187-8). It is not a question of what *we* are doing to the earth, it is a question of what *we* are doing in concert with earth processes and inhuman forces. We cannot, as it were go *against* the earth, go *against* climate, we can only follow after the flows of energy. And, in the case of fossil fuels, either increase their mobility and release their energy, or not. One of the best explanations for climate change that I have ever heard was from a climate scientist on the blog Real Climate, who said, 'The climate is like a crack addict raiding a bank, you wouldn't want to get them excited' That is, the climate represents an already highly unstable system that you would not want to add further instability too. It is not a case of "our" responsibility *for* the earth, but our responsibility to those forms of participation that are a collaboration between humans and fossil fuels in

geologic life. And a responsibility towards recognising and being accountable for differentiated forms of geologic life. This is as much about the reception of new forms of subjectivity and models of the earth as it is about creation of new energy forms. It is about anonymous materials that have distinct life-forming effects/affects. In this sense, these anonymous materials in some way (although not conventionally recognized in our systems of meaning) decide to participate or are open to collaboration. One way to think this collaboration between the dead and the living is through a geologic corporeality. Feminist work on corporeality has provided a compelling account of how to account for inheritances that mark and differentiate the body (Grosz 1994; Diprose 2002). And this work has done much to complicate the emergence of subjectivity and point to forms of collaboration across life, particularly with nonhumans, so that the subject can never be thought alone, as one, but always because of the many (Bradotti 2010). This is also Felix Guattari's notion in psychic life of a collective production of subjectivity, where there is no self-sufficient subject, but differing forms of co-production and prohibition (Guattari 1995). Within this work, attention is located on the collective possibilities and a distributed understanding of responsibility, rather than the isolating logic of much sustainability literature, which reinstate a neoliberal subject that is entirely responsible and "free" in their choices, coming to a decision independently of social and collective assemblages. My objection to this literature is that it isolates subjects and then reprimands them, concentrating on limits and behavioural modification, rather than understanding how the production of subjectivity is relationally produced. To isolate the subject between the twin poles of self-sufficiency and populations is to cast adrift the collective action and reciprocation in the crucially important shared work of becoming otherwise. This isolation often works against the very concepts of change (as collective action) it purports to support.

Notions of subjectivity that emphasise duty and blame to pathologize certain practices that were hitherto an acceptable part of the "good life" isolate individuals to bear the brunt of responsibility while governments fail to built effective institutions the reduce and ameliorate the impregnation of fossil fuels in the collective corporeal and societal body. In sustainability literatures, "behaviours" are curiously cleaved off from the subject to be operated on, made better, trained towards new practices, without any acknowledgement of how collectively, and to different extents, life has been constitute *with* and *in* fossil fuels (and as if this inheritance did not matter or constrain and direct life in various ways). That is to say, **a cultural account of fossil fuel consumption is not sufficient to account for the imbrication of biological and social dependences on fossil fuels as life-forming materialities**. Or, to put it another way, how fossil fuels drive cultural forms, in so much as fossil fuels generate particular imaginations and material manifestations that are uniquely part of becoming with (for example, fossil fuels underpin the energy and chemical revolutions as well as the explosion of nineteenth century population growth). It might be more useful to think an inter-corporeal assemblage of live bodies and dead fossil fuels that are mobilized into cultural and political forms, rather than following the material of fossil fuels through politics or making fossils fuels an individuated material choice. This is not something we should or could do alone. Moreover, such a division between the cultures and natures of our geologic life suggest an uneven distribution of attention and agency.

This question of *how* fossil fuels are materialized within subject-earth relations is crucial for issues of responsibility. Thus is not a case of mind over matter, of behavioural management for sustainable practice, rather a need for *unlearning* forms of becoming that constitute contemporary life, and rethinking nonreproductive productions of subjectivity so that the future can be lived differently. Contemporary nature (human and otherwise[36]) is not

indivisible from fossil fuels, so to think of a futurity without fossil fuels, undoing forms of becoming that are co-constituted with fossil fuels is as much a part of reconstituting energetic materialities as the formation of new collective subjectivities and material forms of life.[37] The matter under consideration—fossil fuels—is not outside of life. Geological matter has a life (albeit a dead one); it directs, forms and differentiates. This is not in any way to try and divert attention away from or disavow the vested interests that underpin the continued mobilization of fossil fuels, nor to suggest that the use of those fuels is not highly differentiated and attribution should not be sort. Rather, to try to come closer to understanding what a geologic corporeality might consist of. To understand geologic life as a cultural practice misses how we have become *with* fossil fuels. The false opposition of fossil fuels and pleasure in discourses of limits and prohibition fails to properly acknowledge the openings of these materialities and what they *give* (even before we are born). And how that gift must become in someway the site of another gift that opens up possibilities for pleasure, for expansion and energetic expenditure.

As Clark comments, in the context of fire co-dependencies, 'In a field of shifting forces, variable energies and inconsistent aggregates of matter, mastery is out of the question: it must be a matter of working with, rather than against the transmutational properties of the physical world. Thus '(o)ne is obliged to follow when one is in search of the "singularities" of a matter, or rather of a material (Deleuze and Guattari 1987, 372). Because know-how is context-dependent, and the context is constantly re-configuring itself, knowledge resists codification into invariable rules or abstract principles' (Clark 2011, 175-6). *Following fossil fuels*, then requires not just making them abject within social practices or demonizing their usage and consumption, nor focus on a discourse that emphasises the prohibition of limits, but something more generous that acknowledges what they have opening up in social practices, in

life forms and what has been *given* by this energy as an inheritance that is at once corporeal and planetary. If this given-ness or gifting of energy is disavowed, the issue of fossil fuel usage remains 'outside' forms of corporeality, desire, reproduction, becoming. This wilful disinheritance of the geological has a cost in its prohibition of understanding of what is carried forward into the future. If this geologic life is disclosed through the inheritance of dead matter, the compressed strata of afterlives, then it is the threshold and terms of disclosure that is at stake rather than the usage/practices with these geologic materials. That disclosure is corporeal, in the realm of experience, not in the realm of the behaviours that are cleaved off the body as operative spaces, as so much sustainability and climate science literature puts it. Fossil fuels must be addressed in terms of experience and corporeality; experience that is already geologic in its texture and inheritance that must in some way turn against itself to redirect the inheritance of the Anthropocene.

4 Conclusion: *Following after fossil fuels*

In both past and future incarnation we follow after fossils, in so much as past fossils are ancestral and thus their origin stories and corporeality precede us, and in the imagination of a future fossil, the spectre of that fossil haunts or foreshadows the formation of the present. After the collapse of the origins into ends that the new origin stories enacts, there is another form of fossil life that we follow after that needs our attention in the imagination and actualisation of climate futures, that of fossil fuels. For those of us that are alive now, our most potent form of geologic life follows the matter-energy of fossil fuels. If it is us who follow after fossil fuels, then the questions that should be ask change: *What kind of intimacies do we have with fossil fuels? How have these fossils bedded down over generations to drive forms of life, desires and possibilities? How are we thoroughly geological in our composition in pre- and post-industrial iterations?* We might start by understanding our love of this

geologic life; the openings and intensifications that fossil fuels provide for life. What thinking with *geologic life* suggest is that there needs to be a shift in understanding around the intercoperality of geologic materialities and its inheritances. In this paper I have argued that in multiple ways, ontologically and materially, being is always *tied into being-toward-the-geologic*. And that rather than resisting or denying the openings of fossil fuels to forms of life, these modalities of geological life need to be properly understood as gifts from the dead that have a corporeal efficacy, which needs to be unlearned if traversal cuts are to be made across such energetic-matter collaborations to new futures.

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[1] Prehistory has many incarnations. For scientists in disciplines of paleontology and geology it tends to mean everything that happened before the written record and the ability to store information and experience outside of genetic codes.

[2] This reference to ancestral fossils is used within the context of archaeological literatures to denote a fossil that is ancestral to contemporary hominids rather than in the terms deployed by Quentin Meillassoux. Meillassoux's concept of an "Arche-fossil" is an anterior fossil before life, but in the present, like light from stars. 'Arche-fossils or fossil-matter, as Meillassoux calls them, are *not* entities that exist *in* the ancestral or time anterior to the advent of consciousness and life, but are rather *material traces* of the ancestral *in the present*.' (Bryant 2009). Bryant suggests that 'In affirming the existence of primary qualities that we can know, Meillassoux is claiming that there are properties of objects that are not the result of the objects relation to us. Or, put a bit differently, these properties are not *dependent* on us' (Bryant 2009).

[3] 'The geographical imagination of human difference is also one in which human mobility features in particular ways. Human diversity is based on the environmental adaptations of different groups after migration from Africa, but this is accompanied by an imagination of subsequent relative isolation that is undone by modern migration.' (Nash 2005, 456)

[4] Grosz suggests Derrida's concept of the "to come" is that, 'Which is the unforeseeable, the yet-to-come that diverges from the what is present. This is what futurity is, and the way in which the implosive effects of the to-come generate both the possibility and the undoing of force.' (Grosz 2003, 142-3).

[5] Rudwick traces the word fossil to its origin in Aristotle's *Meterologica* who 'used it to describe *any* distinctive objects or materials dug up from the earth or found lying on the surface' (Rudwick 1972, 1). In Gesner's reorganisation of the term, fossils became organised

into those that resembled organisms and were termed "organised fossils" and the rest that retained the term "objects dug up" (in modern palaeontology these are called *Problematica,* 'as a collection of objects that are doubtfully organic or at least of uncertain affinities'). Fossil fuels were the exception to *Problematica* and retained the term fossil (Rudwick 1972, 2).

[6] Once climate futures escape the exclusion of their origins there is an opportunity to think about forms of the human that exceed the patriarchal sign under which the climate change subject is currently produced in the "Age of Man."

[7] In Grosz's terms the fossil is a gift in so much as it gives time and moves "freely" in terms of exchange. She says; 'The gift, as Derrida says, gives time. It does not give itself, an object, the given, to be possessed or consumed: it gives temporality, delay. A timeliness without calculation. The is the very time needed for the time of judgment, the ideal of the law itself: the gift gives a possible future, a temporality in excess of the present and never contained within its horizon, the temporality of endless iteration, opening up the future…' (Grosz 2005, 68)

[8] The beginning of time that the origin installs presupposes the possibility of an end of time in so much as if there is a point at which things begin, there can also be a point at which they end. If there is no origin as such, then there is no proposition of finitude, only differentiated forms of becoming.

[9] If climate change has brought anything into being it is a reengagement with origin stories and extinction events: with grand narratives, existential questions, worldly concepts and universalised nature. Just as "Man" was on the verge of disintegration as a stable concept in critical and feminist theory, becoming posthuman, nonhuman and generally undone as a self-sufficient, autonomous subject, the narratives and sciences of anthropogenic climate change have reinstated the human as an atmospheric and geologic agent that is, as it were, responsible for the world (and acting irresponsibly according to the moral coda that underpins much of

these narratives). To say we are responsible for the earth, the whole of the earth is absurd. Only local resolutions to responsibility and new forms of affection for nongeologic forms of life can be taken seriously.

[10] Archaeologist Clive Gamble questions the lack of interest in the expectation and materialisation of colonization over the planet that is evident in prehistoric archaeology and early exploration in his book *Timewalkers* (Gamble 1993, iv). Yet, there is a further question that unsettles this argument of why there are people everywhere and that is Antarctica. While the frozen continent is often rendered as out of time (as a relic of the last ice age), it does provide a prehistoric and contemporary foil to the naturalisation of humans on a global scale. Furthermore, when Antarctica is remembered so are the oceans and other equally important areas of the planet that do not provide a "home" for humans.

[11] Gesner (1516-1565) author of *On Fossil Objects* (1565), suggested that the "natural magic" of fossils was an essential reason for thinking about fossils, to delve into their hidden affinities and what they revealed about the ontological analogy between man and the universe and the "sympathies" there within. Rudwick says: 'Gesner placed the 'power' *(vis)* of his 'fossils' in first place, even before their 'nature'' (Rudwick 1972, 18-21).

[12] The Anthropocene might be thought of as a form of geomorphogenesis (land + form + origin) that has entered the geologic scene as an agent of control and expenditure.

[13] Serres suggests that 'The population, let loose, ravages everything in its path, and that is the Latin meaning of the word *population*, the ravaging masses.' (Serres 2005, 83)

[14] If there is only a singular ontology there is no register of difference. Grosz asks the question, 'Can there be an ethics between men and women that does not rely upon or presume a common or neutral ground that the sexes (or races) share?' (Grosz 1995, 120). While there is sexual difference in nature, she argues following Luce Irigaray, there is always at least two (Grosz 2011, 149; Grosz 1995, 122). While prehistoric man is often accorded neutrality

through the negation of time (that is carried forth in the geologic temporality of the Anthropocene), he is rendered pre-historical and thus assumes an originary position that is undifferentiated.

[15] An example here of a *genealogy of forms* that utilises a particular notion of the "geo" is the concept of an operative earth that emerges in the earth-objects of General Circulation Models (GCMs) that begot the operative subject of sustainability, which has in turn begot (through its failure to be successfully operational) the return of a new operative earth in the form of geo-engineering.

[16] Much of the climate policy and sustainability literature bifurcates the human into either population or individual, which parallels closely with the nation state and neoliberal subject as the twin poles of identity under late capitalism.

[17] The 'Happy Holocene' refers to the epoch of climatic stability since the end of the last ice age 11,500 years ago.

[18] Geologist Marcia Bjørnerud suggest there should be less anthropomorphising and more geomorphising (Bjørnerud 2005, 6).

[19] The "Out of Africa" theory is associated with Chris Stringer of the Natural History Museum, London, who argues that modern humans first evolved in Africa and then migrated all over the world, generally replacing the pre-human species of other continents over the last 100,000 years, including the Neanderthals in Europe. There are also several notable other models of human evolution: the Hybrid Model (Bräuer); the Assimilation Model (Smith and Trinkäus); and the Multiregional Model.

[20] The term "*Homo sapiens"* derives from Carl Linnaeus who designated the species of humanity with the term "wise" in 1758. In light of the Anthropocene such sage species-being is currently being questioned (see Cribb 2011).

[21] Gamble argues against the simplistic notions of adaptation, a common sense version of settlement, instead he suggests exaptation—an unforeseen consequence of changes in human behaviour. He says, 'The problem with adaptation is that it can become a tautology… Exaptations are coopted for use rather than designed' (Gamble 1993, 5).

[22] This might get us someway towards Haraway's call to 'theorize an "unfamiliar" unconscious, a different primal scene, where everything does not stem from the dramas of identity and reproduction… I believe there will be no racial or sexual peace, no liveable nature, until we learn to produce humanity through something more or less than kinship.' (Haraway 1997, 265)

[23] As Catherine Nash argues, 'The claim that 'we came from Africa' in terms of genetic descent and prehistoric migration with its supposed implications of fundamental unity seems to neutralize the simultaneous effect of rebiologzing 'race'… (Nash 2005, 456)

[24] Grosz speaking to Derrida's concept of *différance* says: 'From the very earliest conceptions of *différance* he develops an understanding of the ''worlding of the world,'' the marking of the earth, as a mode of cutting… This movement is also a bringing together, a folding or reorganizing, and the very possibility of time and becoming' (Grosz 2003, 135-6).

[25] There is a virulent gestural politics of climate change that gives voice to "Many Small Voices" of Pacific Islanders, Tuvaluians, Inuit and other rapidly altering indigenous territories, but these politics have such a visibility precisely because they are gestural and not a location of power.

[26] Nancy suggests that the presumption of the tie already having been tied elides the work of establishing community.

[27] Jazeel takes up Spivak's concept of planetarity to suggest, 'the challenge planetarity poses is the *work* of grasping the aesthetic and actualities of incommensurable differenced from their own insides out, because it is that hard and uncertain work without guarantees that

decentres the ‘we’ beholden to the cosmopolitan dream of a rationally knowable universality. In this sense, *un*learning is a crucial part of the work that planetarity demands, and unlearning cosmopolitanism is one such step toward more egalitarian modes of living together’ (Jazeel 2011, 89).

[28] Diffraction of new forms of the human through our current body leads to the possibility of new futures.

[29] The concept of adaptation itself is raised in a field inflected with the legacy of Darwinian understanding of species evolution and succession. But, if Darwin the geologist was taken up rather than Darwin the biologist, or rather if the geologic was emphasised on par with the biological how would this change the kinds of conversations that could be held around the organic and inorganic, live and dead matter. How would a geological perspective shift or open up the possibilities for comprehending our inhuman origins more fully? (Darwin, 1839).

[30] That is an ethics for the possibility of tomorrow.

[31] See Clark for a discussion of the “ground” of philosophy and social theory and its tendency towards “flat ontology” (Clark 2011, Cp 1).

[32] Anthropogenic climate change as a collective experiment with fossil fuels has an element of undecidability within that is not to do with knowledge gaps or uncertainty, but nonknowledge or futurity. Grosz suggests that what ‘the principle of undecidability implies is that the control over either the reception or the effect of events is out of our hands, beyond a certain agentic control. This is what an openness to futurity entails: that things are never given in their finality, whatever those ‘‘things’’ might be’ (Grosz 2003, 149).

[33] Stengers uses Whitehead’s term patience (or “patience of the environment”) to describe a certain ethos in which an organism grasps aspects of its environment that are “patient” with the organism in the giving and receiving of interests (Stengers 2008).

[34] Melancholy is a formation characterized by disavowing, failing to mourn a loss and the dejection that this induces (See Diprose 2002, 97).

[35] Here, Grosz's framing of culture as nature's prosthetic, or part of its *charge* and innovation, ties an ontology of life across social-natural worlds as 'a point of connection and transition between the biological and the cultural, the ways in which matter opens itself up to social transformation, and the ways in which social change works with and through biologically open, individual and collective, bodies' (Grosz 2004, 37).

[36] Nonhuman forms of life are equally co-constituted through the force of fossil fuels, from the use of organophosphate fertilizers in farming practices to the impact of oil pipelines and tar sands on the possibilities of reindeer migrations.

[37] To even think a world without fossil fuels is difficult to say the least; every hospital, every form of food production, every form of modern communication, every form of modern life is impregnated with the work of fossil fuels.