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Scaling Up the Self, Scaling Down the World: Self-objectification and the Politics of Carbon Offsets and Personalised Genomics

Joshua Reno
Binghamton University--SUNY, jreno@binghamton.edu

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CSAC-2015-0066.R2 - Scaling Up the Self, Scaling Down the World: Self-objectification and the Politics of Carbon Offsets and Personalised Genomics

Abstract

Two global initiatives, the Genographic Project and the Carbon Lottery, share an ambition to make abstract, global processes—human evolution and climate change—comprehensible and engaging to non-specialists. Despite their differences, they both do so by means of self-objectifications that scale up the selves of participants and scale down complex, spatio-temporal models of human-world relations. Based on the author's auto-ethnographic experience as a participant in both initiatives, it is argued that carbon calculators and personalised genomics involves a pragmatics of scale that evaluates and compares users on the basis of their relative expression of, or deviation from, a standard. Furthermore, this is not based on actual resources that participants do or do not possess, but on forms of capitalist exchange that underwrite carbon trading and population genomics, as experts and corporations make fungible intellectual property derived from purportedly rare DNA and sustainable practices, which are typically indigenous and non-western. In fact, for users of these initiatives, the global inequalities that make possible transactions in carbon offsets and genetic ancestry are obscured from view. As a result, though initiatives like the Genographic Project and Carbon Lottery may provide comprehensible self-objectifications, they potentially make the world more unequal in the process.

Keywords:
Scale, Exchange, Carbon Calculators, Population Genetics, Space-time, Objectification

Introduction

Evolution and climate change remain very controversial ways of thinking about how people relate to the world, despite widespread acceptance of these models within the biological and Earth sciences, respectively. It may be that the findings of climatology and evolutionary biology are difficult to accept because they defy the appeal of naive empiricism. Climate and evolution are general patterns that gradually develop over long periods of time and, for this reason, cannot be directly observed as such. One cannot perceive trends in global climate by documenting the current weather in a single location, anymore than one can perceive evolutionary processes by studying a single organism in isolation. Because climate and evolution are complex, long-term spatio-temporal processes they can seem abstract and impersonal when compared to everyday experience on a human scale (Aubrey, 2009; Irvine, 2014).

This article considers attempts to bridge the gap dividing everyday life from scientific models of long-term change, to make models of the world comprehensible for the general public. The two examples selected for analysis—the Genographic Project and the Carbon Lottery—are particularly noteworthy because they use personalised genomics and carbon offsetting, respectively, to make abstract models of human evolution and climate change comprehensible for non-specialist users.

These are very different endeavors, in many ways.

The Genographic Project is now over a decade old, having begun in 2005 as an ambitious effort to collect hundreds of thousands of samples of DNA from people all over the world in order to answer questions about human origins and intercontinental migration. For a fee,

volunteers can purchase a kit, swab their cheek cells, and acquire an authenticated genealogical map of their ancestry, while at the same time contributing to the aims of population genetics.

By contrast, the Carbon Lottery lasted only for a few months in 2011 as an effort to popularise the voluntary offset market in carbon credits. For a fee, volunteers could calculate the cumulative carbon emissions of their private activities, acquire authenticated certificates to offset them by investing in emission-reducing activities abroad, while at the same time entering a lottery to win millions of Euros.

In this paper, I do not address the relative success and failure of these initiatives, but what they share in common. Despite their differences, both had backing from large corporations and both actively strove to attract members of the general public to participate, learn more about themselves, and contribute to global entrepreneurial efforts. To do so, both initiatives endeavoured to make available and comprehensible to general users an abstract model, evolutionary or climatic, of how humans relate to the world, its past and future.

How do they package climatic and genomic facts to make them interpretable for the broadest possible audience? By addressing this question, this article contributes to what has been a relatively neglected domain in the field of science studies: the social uptake of scientific ideas and particularly 'the struggles behind and resistances to popularizations of science' (Cooter and Pumfrey, 1994: 238). Scientific practices and forms do not remain confined within laboratories, classrooms and textbooks, but enter into social relationships and everyday experiences as 'facts-in-the-world' (Dumit, 2004).

At the same time, categories like popular science, public understanding of science, or science popularisation presuppose and reaffirm historically contingent and increasingly outmoded boundaries between scientific practice and everyday social life (Bensaude-Vincent, 2009). Neither the Genographic Project nor the Carbon Lottery could be characterized as purely scientific or commercial endeavors, yet both attempt to help non-specialists grasp very specialised forms of knowledge.

To be shared with anyone, regardless of background or education, scientific data must be represented in accessible ways, relatively free of the specialist jargon and rhetorical style characteristic of peer reviewed articles or scientific papers. Based entirely on auto-ethnography—the author's participation as a consumer of both initiatives—the article asks how the spatio-temporal complexity (or big, impersonal scale) of climate change and human evolution are strategically packaged into representations that are meant to communicate information about the self of the user. As such, the focus is not on how particular selves interpret such representations, per se, but on the way that developers have made scientific abstractions publicly accessible as comprehensible visual and textual signs. By looking at the representations made public, it is possible to identify design choices, including what was excluded from the information provided to users. To understand why these representations and exclusions matter, the analysis uses concepts from critiques of objectification and capitalist exchange, which address the politics of scalar representation in distinct but complementary ways.

The paper argues, first, that these initiatives accomplish similar ends through very different means. The Carbon Lottery makes use of carbon calculators and gaming, and the Genographic Project genetic markers and identity discovery, but both endeavor to personalise controversial and abstract models of spatio-temporal change. In order to do so, they enroll participants on the basis of ideologically mediated interpretations of human difference, dividing those that are purportedly standard from those that are purportedly rare and valuable.

Secondly, the paper argues that the online platforms and virtual products produced by both initiatives are designed to draw attention away from the geo-political conditions that make them possible. Genomic analyses and carbon-offset exchanges are both typically premised on the propertisation of assets, produced by technical practitioners, yet derived from non-western and indigenous peoples. Consequently, the analysis also considers to what extent the platforms designed by the Carbon Lottery, the Genographic Project, and related programs incorporate and/or exclude relations between buyers and sellers of climate and ancestry data. For both initiatives, global power differences provide the foundation for the production and propertisation of genomic or climatic information, yet this is mostly concealed from the representations made available to users.

In the conclusion it is argued that efforts to personalise complex scientific processes, to make abstract evolutionary and climatic scales comprehensible, could instead be directed towards highlighting the unequal conditions associated with the production of genomic and climatic information for sale or study.

Scaling Practices

Climatic and evolutionary changes occur at spatio-temporal scales of mythical proportion, connecting each individual to the whole of humanity and to the collective history of all life on Earth. In theory, every carbon emission adds to the anthropogenic transformation of the atmosphere and pushes us closer to an increasingly inhospitable world, just as each organism is the outcome of a chain of inheritance and selection leading back to the origins of life itself.

Personalised genomics and carbon offsets endeavour to make these connections visible and actionable, relating specific individuals to global, long-term processes and relations, often so they can take more responsibility for their bodies and economic practices.

Doing so means solving a scalar dilemma that Keith Hart puts succinctly, 'How do we bridge the gap between a puny self and a vast, unknowable world? The answer is to scale down the world, to scale up the self or a combination of both, so that a meaningful relationship might be established between them' (2007:16). Hart develops his conception of scalar practices partly from Heidegger (1977, 1995). Heidegger argues that the objectification of the world as an indivisible whole by 'modern science' is artificial, but so too is the complementary abstraction of finite selves dialectically opposed to the world in 'solitude'. Scientific models of planetary space-time are never simply about the world in-itself, from this view, but tend to involve an evaluation of 'whatever is, in its entirety, from the standpoint of man and in relation to man' (Heidegger, 1977: 133).

Following Heidegger and Hart, scale is not an absolute property of the universe, but is inherently relational and mediated by various social and technical practices (Zhan 2009; Tong, 2014; Choksi, 2015, Tsing, 2015). In a recent edited collection on scale, Carr and Lempert (2016) argue that representations help bring scalar differences and similarities into being, from everyday talk to diagrams and descriptions. In a similar way, Hart points to praying and reading novels as scaling practices that, in different ways, relate selves to world(s). Scalar work does not simply reveal an already existing objective totality, but offers particular ways of apprehending qualitative and/or quantitative relations between world(s) and scale-construing, scale-jumping selves.

In order to make complex, spatio-temporal processes like climate change and evolution comprehensible, scalar practices 'order phenomena with respect to each other… imaginatively placing the phenomena of experience in wider (and narrower) relational fields' (Gal 2016: 92).

Scalar practices not only bridge divides across space, but time as well: 'When one tries to apprehend things and their qualities, a present moment may be linked to and authorized by a moment figured far back or projected forward in time. In order to determine when and where we are, we may evoke a grand continuity' (Carr and Lempert 2016: 2).

In the examples under consideration, I argue that carbon offsetting and personalised genomics create representations of selves and how they relate to worlds by upscaling and downscaling. In both cases, furthermore, this involves ideologically enrolling and eroding differences between this abstract self and global others with whom they are relationally compared and evaluated.

Scalar Practices as Ideological

Downscaling the impersonal and upscaling the personal depends on abstraction—the complexity of the world and/or the self is reduced in some way; specific attributes are amplified so that the world becomes more knowable and the self becomes more significant. Both the Genographic Project and the Carbon Lottery scale up the self and scale down the world through a form of abstraction I term *self-objectification*. The Carbon Lottery and Genographic Project employ self-objectification to reduce the complexity of climatic and evolutionary processes and relate them to specifically rendered selves in a standardised and technically precise way.

Scaling practices that produce abstract representations of the world need not be experienced as exploitative and alienating, but can be personalised as part of strongly felt, subjective attachments and identifications. Benedict Anderson (1991), for instance, relates the spread of 'homogeneous, empty space-time'—an abstract representation of the global present as including everyone equally—to the rise of the modern nation-state and to nationalist subjectivity. Through print media like books and newspapers, disconnected individuals throughout the globe and throughout history are unified as part of shared national histories and territories, an imagined community, making abstract space-time personal and subjectively meaningful.

Similar processes are at work even in seemingly post-national models of and for the world. Evolution and climate change not only describe the world and human relations to it, but are also associated with social movements and political agendas, whose advocates endeavour to scale up their causes by embracing an empty, homogenous space-time that unites the whole world and all life. In these instances, scale orients, compares, connects and positions people with respect to one another (Carr and Lempert 2016: 3).

Because they are inevitably partial and particular, scaling practices are perforce ideological. As Susan Gal argues, 'scaling implies positioning and, hence, point of view: a perspective from which scales (modes of comparison) are constructed and from which aspects of the world are evaluated with respect to them' (2016: 91). If self-objectification relates selves and worlds, it does so through representations of others taken to be different from the self in some way. According to Mei Zhan (2009), scalar practices (what she terms 'worlding') can draw upon and reaffirm differences between people, as happened with the introduction of Traditional Chinese medicine into the global marketplace. Insofar as abstraction entails obscuring the way things actually are, moreover, the objectification of selves can also result in politically damaging objectifications of others.

The scalar order that Anderson associated with the modern nation-state is not merely homogeneous, but homogenising and contested from within (Silverstein, 2000: 128-129). This means that any kind of standardisation of collective belonging demands 'continual affirmation' (Song, 2010: 83). In other words, any self-objectification of one who exemplifies a standard,

whatever it may be, relies on complementary and ideologically motivated objectifications of others who are taken to deviate from it.

In general, carbon offsetting and population genomics rely on contingent and contested divisions between global south and north, rural and urban, settler and indigenous which ultimately derive from imperial, geo-political categories (Coronil 1996). While climate and genomic data may appear politically neutral, they cannot help but be rooted in 'a constitutive relationship between Western representations of cultural difference and worldwide Western dominance' (Coronil, 1996: 57). Users of the Carbon Lottery and Genographic Project typically consume comprehensible objectifications of their selves by means of enabling objectifications of others who are thought to deviate in some way from their genetic and carbonic standard. These relations are not premised on absolute dichotomies between self and other, but depend on subtler, relational distinctions along continua of gene-inheritance and carbon emission. It is therefore necessary to attend to these articulations of difference as productive of expansive scalar projects that are meant to embrace everyone in the world uniformly.

Climatological and genomic projects incorporate the purportedly rare and valuable bodily cells and environmental practices of global others, which must be translated by technical expertise into comprehensible information in order to make possible the sale of personalised facts. We can therefore ask whether personalised scalar uplift provided to users of these initiatives reaffirm or (as some of their proponents would claim) challenge reified geo-political categories, such as white/non-white, developed/undeveloped, settler/indigenous, or not.

Scalar Projects and Capitalist Exchange

Following Hart (2005, 2007), self-objectifications upscale the self but also downscale the world. Shared experiences of empty, homogeneous space-time, for example, are the result of centuries of techno-scientific innovation and politically enforced coordination (Kelly, 1998). Achieving internationally consistent time zones and global positioning required infrastructure that had to be agreed upon and constructed by powerful actors with global reach (Edwards, 2010). Without this coordination, contemporary scientific models of evolutionary and climatic change would not be possible, because they rely on the scalar division of spacetime into linear, quantifiable chunks. Data can only be useful, for climatologists and evolutionary biologists, if it can be located in space and time with relative precision. Paul Edwards (2010: 251-2) refers to this as 'making data global'. For example, when ancestral fossils and temperature readings are recorded, they need to be precisely associated with a specific stratigraphic or atmospheric layer, respectively. This makes it possible to evaluate and compare otherwise heterogeneous paleontological and meteorological findings as part of an ongoing spatio-temporal process. Only then can data be combined and applied on a global scale to make claims about long-term changes in planetary temperature, or phylogenetic evolution.

Accounts of climatic and evolutionary change rely heavily on the standardised collection, distribution and analysis of contextually embedded data (Edwards, 2010; Thacker, 2005), which allow climatic and evolutionary models of the world to be personalised for and sold to different users. This form of exchange may seem to differ from other capitalist endeavors insofar as natural processes are thought to generate value in and of themselves, not only because of how they might be transformed by human labour and knowledge. The apparent generativity of biological resources 'is configured as accumulated labour power, the products of which can be harnessed to create productive futures. This belief is based, it bears emphasizing, on a metaphor: that organisms are labourers' (Helmreich, 2008: 474). As an organism, a human being can have

their genetic ancestry assessed or their carbon emissions calculated, but they are only the source of this information, they do not bestow it with economic value. Personal genomics and carbon offsets are products of highly technical expertise. Rather than metaphorical labour, this might be better thought of as metaphorical ownership, where assets are derived from people's bodies and actions as a result of the techno-scientific labour that others perform.

In this sense, a form of property is generated that can be bought and sold. Anna Tsing connects the literature on capitalist exchange with that on scalar ideologies of natural difference. She characterizes scaleability as a project of expansion that can only be made fungible property at the expense of difference: 'Scaleability requires that project elements be oblivious to the indeterminacies of encounter; that's how they allow smooth expansion. Thus, too, scaleability banishes meaningful diversity, that is, diversity that might change things' (2015: 38). Complex ecological processes may resist scaleability. Yet, they still can be co-opted as part of capitalist accumulation processes, which Tsing describes as a form of salvage (2015: 62-63).

Personalised genomics and carbon trading do not involve producing and trading in traditional commodities, yet the economic processes involved are not therefore new. If technical expertise produces new forms of fungible property, it can also be argued that it leads to the generation of rents. Acording to Birch and Tyfield, in cases like these 'value results from the application of knowledge to nature, and the subjection of that knowledge to intellectual property rights, and not from nature itself or from particular biological material' (2013: 315). Rather than describing these processes using popular terms like biovalue or biocapital, they are better thought of--following Boyd, Prudham and Schurman (2001:18)--as a form of 'strategic rent-seeking'.

Economic processes associated with personal genomics and carbon offsets tends to involve a combination of propertising assets for exchange and rent-seeking. Before ancestral and climatic data can become comprehensible for a user, specific cells and environments must be identified as assets worth acquiring property in. Both carbon offsetting and personalised genomics are reliant upon uneven access to and control of biological information according to a new global division, whereby some have resources they lack the means to exploit so that those that do can extract rents from them. TallBear and Reardon (2012) argue that population genetics tends to be premised on the assumed right of white, western scientists to salvage surplus value from indigenous lives and land. A similar criticism is often made with regard to carbon offsetting schemes (Lohmann, 2012: 97; Felli 2014). The North American based Indigenous Peoples Council on Biocolonialism explicitly links these activities, which experts in the techno-scientific and policymaking fields usually tend to imagine as separate.

Insofar as they are premised on carbonic and genomic difference, carbon offsetting and personal genomics only stabilise climate change and evolution narratives by anchoring them to unstable objectifications of self and other. Actual relations between people in our unequal world are at least as complicated as climatic and evolutionary processes. And yet, the unequal world within which climatology and bioinformatics take place may be taken-for-granted or altogether excluded from the representations made available to users who pay to offset their emissions or understand their ancestry.

Both the Genographic Project and the Carbon Lottery have their origins in controversial initiatives, the Human Genome Diversity Project (HGDP) and the Clean Development Mechanism (CDM) respectively, which attracted criticism from various activists, journalists, scientists and diplomats as new ways to exploit the resources of the world's rural, poor and indigenous peoples. While the initiatives discussed in this article attempt in various ways to distance themselves from these earlier projects, both still rely on salvaged and scaleable

materials recovered from non-western others in order to produce a comprehensible self-objectification for more privileged users.

Histories of the Present

I begin my analysis by explaining the background of both the Genographic Project and the Carbon Lottery, both of which emerged out of more controversial initiatives. For this reason, both incorporate the critiques and failures of their predecessors in their attempt to make population genetics and climate change mitigation comprehensible to non-specialist users.

Mapping Selves onto Ancestral Human Pasts

Like other genomic initiatives focusing on collecting diverse genetic samples, the Genographic Project has its origins in the Human Genome Diversity Project (or HGDP). The HGDP was itself developed in response to the global and revolutionary Human Genome Project. Population geneticists like Luca Cavalli-Sforza argued that targeted genetic sampling of non-western populations would lead to a more complete understanding of the human genome and unlock secrets about the evolution of humankind, our similarities and differences, and migration across the globe (TallBear and Reardon, 2012: S238).

This initiative can be understood in terms of the scaleability necessary for economic exchange. In Tsing's (2015) terms, making population genomics more expansive meant incorporating a purportedly exceptional form of difference in order to generate a more robust model of human nature.

Criticism of the initiative, which came especially from Native-American groups who refused to participate, identified the HGDP as a form of surreptitious economic extraction (TallBear and Reardon, 2012). And it was on this basis that this initiative was successfully contested. Shortly after its announcement in 1991, the HGDP was severely criticized for its failure to consult with non-western and indigenous groups in research design and implementation, as well as for attempts to patent some of the genetic samples collected as intellectual property, a "knowledge asset" from which future rents were to be extracted (Birch and Tyfield, 2013). Additional criticisms focused on the presumption that indigenous peoples represented an isolated and quickly vanishing resource, which resembled the evolutionist and racialising assumptions of early twentieth century salvage anthropology.

The HGDP fell from prominence amidst this criticism, but in its wake several other genomic diversity initiatives emerged with similar goals but a strategy to avoid complicating questions of ethnicity and cultural difference (Thacker, 2005: 167). Spencer Wells, a student of Cavalli-Sforza, is widely credited with conceiving of and making comprehensible the Genographic Project, which began in 2005. Wells openly challenges the accusation that population genetics is racist science (TallBear and Reardon, 2012: S234), arguing that it ultimately reveals all of us to be ancestral Africans, thus unsettling racial typologies (but see Palmié, 2007; TallBear, 2013). What the HGDP and Genographic Project share is a conviction that the human past can be read through information preserved in markers on our DNA (Nelkin and Lindee, 2004), but only if the right DNA is collected and markers analysed. With support from IBM and the National Geographic Society, the Genographic Project sought has collected hundreds of thousands of genetic samples from genetically diverse people all over the globe.

While maintaining its predecessor's focus on salvaging scaleable bio-resources, learning from the criticisms of the HGDP, the Genographic Project included a more robust bioethical paradigm to involve indigenous communities in the research, to protect the rights of those who

choose participate, and to reward them for doing so. Furthermore, the Genographic Project also embraces certain forms of public transparency. They are assisted in this effort through the cooperation and sponsorship of National Geographic, arguably the world's premier populariser of science and human diversity. This includes use of the internet and social media infrastructure of the more established National Geographic brand, with sections of the website explaining the project and links to active blogs maintained by their scientists in the field.

A final crucial difference from the HGDP is the Genographic Project's ability to draw on the popularity of the Human Genome Project and the increasing availability of genome sequencing technologies to medical science and the popular imagination. Embracing these trends, the Genographic Project practices both population genetics and personal genomics simultaneously, inviting anyone interested in slotting their ancestry within wider narratives of human evolution and global migration with comprehensible self-objectifications. Alongside an effort to understand the whole of humanity on a grand scale, across space and time, is an effort to attract visitors to the website and additional participants in the project by offering them the chance to purchase a kit, submit their own sample, and receive a determination of their own ancestral history.

Calculating Emissions to Gamble on Climate Futures

Just as the Genographic Project emerged from the controversial HGDP, the Carbon Lottery was made possible by the controversial Clean Development Mechanism (CDM) of the Kyoto Protocol. The HGDP and the CDM sought to recognise geo-political difference in order to avoid homogenising representations of the human genome and global economics, respectively. The HGDP was designed to incorporate genetic data from the non-western populations left out of the Human Genome Project; the CDM was designed to incorporate poorer, developing or undeveloped countries in the global reduction of greenhouse gas (GHG) emissions. Upscaling climate policy, from a national level to a global one, means employing ideological distinctions between types of populations. Relative industrial development offers a proxy for a population's contribution to global carbon emissions, which in turn determines which countries should be emitting less and which should be allowed to grow unimpeded, which should pay to offset their emissions and which should be paid.

If an industrialised country decides to use the CDM to meet a portion of their GHG reduction target, as established by Kyoto, they would need to invest in projects in less industrialised countries. These projects would have to be certified as satisfying the criteria of 'additionality.' GHG emissions may lessen over time for any number of reasons; a project only has additionality if emissions are reduced as a direct result of CDM investment. The wealthier country can then claim that their involvement prevented a specific amount of GHG from being emitted. This not only satisfies (or 'offsets') a portion of the wealthier countries obligation to eliminate emissions but, and this is crucial, does so for a fraction of the cost.

While the Kyoto protocol created the conditions for a market in carbon offsets, translating diverse ecological processes and practices into fungible property requires additional scalar work. Specific activities need to be classified and counted as additional, as carbon neutral, as occurring in a developing country, in order to be packaged as relatively uniform, comparable knowledge assets (Birch and Tyfield, 2013). And this must occur for carbon trading to become expansive and pervasive, or scaleable. Before the obligations of the Kyoto protocol came into effect in 2005, brokers facilitated these kinds of emissions exchanges with the expectation of future cap and trade policies coming into effect. Brokers would identify candidate projects,

acquire CDM certification, and trade on the anticipated value of investing in them to offset GHG emissions. This contributed to the formation of a global carbon market.

In compliance or 'cap and trade' markets, governments, corporations, or other organisations seek to offset emissions in order to comply with the top-down imposition of a cap or limit on the amount of GHG they can emit. Carbon credits are a financial instrument that stand in for GHG emissions and can be purchased, traded, and used to comply with regulations. When there are not enough GHG reducing innovations and/or offsetting projects to satisfy the cap, the value of carbon credits is inflated and it becomes more expensive to emit carbon. Crucially—and in keeping with critiques of these forms of carbon markets as rent-seeking (Lohmann, 2012; Felli, 2014)—this is not about the inherent value of GHG reduction, in and of itself, but is a consequence of how compliance markets are designed. In voluntary markets, by contrast, there is no official cap and no artificially produced demand for credits. In either case, carbon markets thus rely on financial speculation and international legal agreements and not the latent value of emissions themselves.

Critics of the CDM argued that this financialisation of emissions exposed the price of carbon credits to the volatility of financial markets (Lohmann, 2012; Layfield, 2013). On the one hand, major carbon polluters, like the United States and China, did not impose cap and trade policies as expected. In the absence of further regulation, it became cheap to emit, removing the incentive for emissions reduction. On the other hand, the 2008 financial crisis hampered worldwide speculation in general, including on climate futures and carbon trading, which reduced demand for offset projects, portfolios, and brokers.

The falling price of carbon was also blamed on insufficient and inexact regulation. During the early years of the CDM, the complexity of proving additionality resulted in many projects receiving approval that should not have (Shapiro, 2010). As a result of these problems, the UN intensified regulatory oversight of CDM approval beginning in 2006. Moreover, various organisations now offer independent verification standards for carbon offsetting projects, which are meant to demonstrate a commitment to transparency and precision.

The Carbon Lottery appeared in the wake of the apparent failures of the CDM and carbon trading. The GHG offsetting projects used by the Carbon Lottery were originally identified and certified by EcoSecurities, one of the first and most successful emissions trading firms. Like most brokers, EcoSecurities profited by serving as middlemen for the European Union's Emission Trading Scheme (ETS). But increased UN scrutiny of projects amid criticisms of the CDM led to a substantial devaluation of EcoSecurities' stock and assembled portfolio by 2007.

As with the bankruptcies associated with other speculative enterprises, the lost value of a carbon offset portfolio reflects changes in political and financial institutions 'rather than a sudden crisis of confidence in the supposedly promissory or speculative value' of sustainable practices in and of themselves (Birch and Tyfield, 2013: 312). This is so because firms that broker carbon trading 'are asset-based enterprises rather than commodity-based ones, in that their value is derived from trade in intellectual property and financial investments, not from the production of biological commodities or materials' (Birch and Tyfield, 2013: 312).

EcoSecurities precipitous decline made it cheaper for JP Morgan to acquire it in 2009 to bolster its position in non-voluntary emissions trading. The Carbon Lottery was first mentioned in 2011, after Sterling Waterford Securities was tasked with managing the EcoSecurities portfolio on JP Morgan's behalf. Throughout 2011, the Carbon Lottery was reported in various climate news outlets as an innovative initiative that would draw the general public into carbon trading using the appealing and familiar formats of the lottery and social media.

The Carbon Lottery's main difference from the CDM, despite similar aims, is that it takes advantage of the growth of carbon calculators online, which seeks to make climate change comprehensible in the form of the calculated carbon footprint of individual households and businesses. In so doing, the goal is to increase environmental awareness and sustainable living, as well as to generate profitable exchanges in knowledge assets.

In this way, the Carbon Lottery was intended to appeal not only to the self-interest of participants, but also to their sense of environmental responsibility. By organising carbon calculation and ticket purchasing online, and holding drawings on YouTube, the Carbon Lottery also used new social media to make abstract financial instruments and climate facts more visible and accessible.

The Carbon Lottery can be understood as an attempt to broaden interest in voluntary carbon trading and to profit from devalued CDM certified projects in the wake of falling carbon credit prices. Its apparent failure to take off may have led JP Morgan to sell EcoSecurities on to a Swiss firm in 2014. However, other major investment banks sold off their carbon credit investment portfolios around the same time, concerned about political conditions less favourable to climate change mitigation, especially in the U.S.

Scaling Up Myself

In this section, I describe the extent of my auto-ethnographic participation in both initiatives and what this entailed. By donating my own cells to determine my genetic ancestry and purchasing my own certificates to offset my carbon footprint, I analysed how these initiatives make claims about climate change and human evolution comprehensible. This involves simultaneously upscaling information collected from myself for exchange and downscaling the resulting models of carbon emissions and ancestral migrations. The use of haplogroups and carbon footprints, in particular, reduces the complexity of evolution and climate change, relating them more directly to myself, my estimated genetic inheritance and environmental impact.

Buying Ancestry

I purchased a Genographic Project Test Kit from the Cornell Campus Store in Ithaca New York in the Spring of 2011. The Kit was being marketed to the Cornell community as part of the 'Cornell University Genetic Ancestry Project' which collected samples from 200 undergraduates, culminating in a heavily publicized local event (see http://www.cornell.edu/video/tracing-the-genetic-ancestry-of-200-undergraduate-students/e3630). As with many of the popular events and publications produced in association with the Genographic Project, the event focused both on general population statistics and on the discoveries made by select individuals who were surprised by what they learned about their ancestral origins.

The Kit cost $99.95 and included a CD-Rom, a pocket-sized pamphlet, thank-you notes from the President and CEO of the National Geographic Society and the Chairman and CEO of IBM, a DNA-testing consent form, detailed instructions on how to participate and access results online, and, finally, to collect and submit the sample, an applicator stick, cheek scrapers, specimen tubes, a small plastic bag and a self-addressed stamped envelope.

In addition to providing instructions that have to be precisely followed, the Kit also offered some choice. As a male, I had the ability to choose whether to have my DNA tested through my 'Maternal' or 'Paternal' lineage, depending on whether the analysis would focus on mitochondrial DNA or the Y chromosome. Genomics depend upon extracting pieces of bodies for analysis, such as cheek cells, which developed as part of a living body and a lived in

environment distinct from their evolutionary origins. Either Y chromosomes or mitochondrial DNA can be used to study genetic ancestry, it is argued by population geneticists, because they are selectively neutral. This means that mutations in these alleles are governed by the rules of genetic drift, and are therefore easier to track as they reappear in predictably distinct form in generation after generation and body after body (Hartl and Clark, 1997).

Put another way, this sampling procedure seeks to produce scaleable and fungible accounts of origins by reducing the ecological complexity of evolutionary processes. Following Tsing (2015), making ecological relationships scaleable means reducing diversity and complexity, but evolutionary processes can only be partially accounted for as a result. Consequently, some criticize the methodological assumptions of population geneticists and their application in the determination of genetic ancestry (see Bolnick, 2008; M'Charek, 2009; and Weiss and Long, 2009).

Having selected my 'Maternal Lineage', assuming this was the more common test, I was then asked to answer questions about my maternal ancestors, which presented some difficulty. This included questions concerning the geographical origins of the oldest maternal ancestor I knew of. This required a conversation with my mother about the unclear ethnicity of her grandmother (whether it was Estonian, as she had reportedly claimed, Polish or Ukrainian). If this folk genealogy was somehow incorporated into my ancestry determination, it is not made clear how or for what end.

All of the materials in the Kit and on the website make reference to the deep time and global expanse of human migration. To make these scalar phenomena comprehensible, they rely on visual and textual representations, which Carr and Lempert (2016) call the 'pragmatics of scale'. The scale of human evolution is stunningly and repeatedly visualised in iconic 'Human Migration Maps' that show networks of diverging and intersecting lines leading out from Africa and across the globe. Very different is the other central image that graces the Kit's cover and many of the Genographic Project's promotional materials: that of a lone, unmarked individual walking across a blank landscape. In many ways, these two images represent the two halves of the discipline of population genetics, and evolutionary accounts more broadly, that must be reconciled; the apparently static genotype of an individual human and the abstract, yet very real space-time of many successive environments and generations, places and times, that make up 'the human journey'.

The scaleable concept that is meant to achieve this reconciliation is 'haplogroup'. This is the subject of the final section of the tiny pamphlet provided with the Kit. According to the pamphlet:

> A haplogroup is a group of genetic lineages that share mutations specific to individuals in that group. Because haplogroups are defined by mutational events that occurred at a specific place and time in history, they typically have geographic distributions that are representative of the age and scope of migration events that make up that history.

The concept of Haplogroup, like that of lineage, is necessary to make genetic information scaleable in two senses. First, it does so as part of a scientific procedure which seeks to make genomic claims about human origins. Secondly, it does so through visual and textual aids to make human evolution comprehensible for users of the Kit. In both cases, the complexity of ecological relationships are reduced and simplified. The latter form of self-objectification does more than make abstract scientific models comphensible. If the concept of haplotype is credited with making possible an expansive and authoritative form of knowledge, its translation into

comprehensible representations transforms this knowledge into a service that can be purchased. My DNA, which forms the basis of this knowledge, is not therefore commodified in the process, but its interpretation does provide the basis for transfers of wealth to occur.

I received notification after several months that my sample had been processed and that I could log on to their website to find out the story of my genetic origins. I was able to do so using the 'GPID' provided with my Kit.

Offsetting Emissions

I entered the Carbon Lottery in the summer of 2011. More specifically, I registered on thecarbonlottery.com (a site that no long exists and a domain name that seems to have been acquired by a new owner). With my account, I was able to use the carbon calculator provided to determine how many carbon emissions I was responsible for, compare this with the calculated national average in the United Kingdom (where I was then living), and purchase the recommended number of tickets.

The carbon calculator consisted of four columns of categories that often appear on carbon calculators of this type. Below each column was the estimated total of carbon emissions this amounted to in a given year (in 'Tonnes CO2e p/a'). To the side was a separate column that listed the total average added from the other columns, the tickets per year required to 'neutralise your carbon offset' and the country average where you live. Above this list it offered the option to post the results of my emissions to Facebook or Twitter. At the bottom was a highlighted button that read 'PLAY Lottery'.

These elements can be found in any number of carbon calculator services online, all of which scale 'up' the information entered by a user's, relating them to broader planetary concerns and comparing them with other carbon emitters on a national or global level.

What makes the Carbon Lottery different is that it combines this scalar work with the broader exchange in carbon offsets. To play the lottery and offset one's carbon meant purchasing a specific number of tickets. A ticket was a line of six lottery numbers that entered the buyer in a drawing and equated to 100 Kilograms offset. Each player was issued a carbon offset certificate that listed between 1-5 lines or tickets and therefore could stand for between 100-500 Kilograms of offset carbon emissions.

If carbon calculators assess the carbon emissions of a user, making these calculations commensurable with the lives of offsetting people elsewhere involves the interventions of brokers and banks. These actors and institutions are drawn to these forms of economic exchange by the profitability of rents (Birch and Tyfield, 2013; Felli 2014). They do not seek to directly own either the calculated emissions of users or the actions of offsetters, rather, they seek to manage access to representations of carbon emissions/offsets in the form of legally authorized and tradable instruments.

Each certificate is such an instrument. They include a certificate number to demonstrate that they have undergone independent evaluation and approval as part of an offset fund. According to a passage appearing on each certificate:

> This offset amount has been evaluated by Sterling Waterford to be reliable, additional, verifiable and permanent, and has been verified under one of the Standards accepted and listed by the Sterling Waterford Green Fund. Sterling Waterford hereby warrants that the stated offset amount will be retired by the Sterling Waterford Green Fund at the end of the accounting period.

Such evaluation relies upon mediated scalar comparisons. Particular populations must be regarded as 'developing' and their activities as 'sustainable' and 'additional'. These are enrolled as meaningful distinctions in carbon offset markets in two ways.

First, they are meant to represent deviations from an unmarked, global standard, which is of 'developed' countries engaging in 'unsustainable' practices. Particular activities can only be packaged as scaleable instruments for the offset market if they represent an exception to those persons and countries charged with calculating the impact of their emissions.

Second, these distinctions can be seen as a response to critiques of the CDM. The very need for independent evaluation, and expert validation, presumes a marked global standard, which is the conception of 'developing' places as risky or unregulated contexts within which to invest or donate. Independent evaluation and approval are therefore meant to satisfy the condition of international climate regulations and reforms, but in doing so reaffirm divisions of the world and its people.

My purchase was made on the 17th of August, which entered me in a drawing that was scheduled for August 30th. The results were posted online the following day. Like the other drawings, of which there were five in total conducted throughout the year, the August drawing was posted on YouTube and still can be viewed there at https://www.youtube.com/watch?v=t8D30wLycCU.

After purchasing a ticket (Figure 1) I was emailed by 'care@thegreenoffsetcompany.com' thanking me for 'buying a ticket and helping tackle climate change', informing me of the date of the next drawing and encouraging me to help and (possibly) win big: 'Help us reduce the effects of climate change and you could become the world's first carbon millionaire!' The name of the hyperlink to the site, as it appeared in bold letters at the bottom of the email, was 'Click here to Play for Good', which was the company's tagline.

FIGURE ONE: An Offset Certificate produced for me by the Carbon Lottery

During the drawings, posted on YouTube, announcers repeat the threefold motivation for participating in the Carbon Lottery: to 'reduce your carbon footprint, help us tackle climate change, and win big cash prizes'. They also take time to highlight specific carbon reducing projects. More will be said about this below, but it offers the clearest example of a carbon offsetting other put in relation to the carbon emitting user. That relation is made possible through the scalar practices of brokers and regulators, who apply their expertise to produce simple and repeatable representations of environmental impact in the form of units of carbon.

After the drawing, the announcer assures viewers, even if they have not won the jackpot, 'You're still a winner. You can never lose at the Carbon Lottery!' Reaffirming that self-interest is only part of what they can achieve by playing, they are also doing something about climate change. Winner and loser become recoded as a carbon calculating and offsetting self as not only a potential recipient of wealth but an actual contributor to global environmental sustainability. Just as those who design the Genographic Project purport that enrolling non-western, indigenous others in DNA collection furthers humanity's understanding of 'our' origins, those responsible for the Carbon Lottery claim that enrolling featured offsetters in this exchange helps humanity heal the Earth.

Not long after the drawing was posted online, I was also emailed before each successive drawing that followed, to encourage me to buy more tickets and win the jackpot, to warn me

when the September drawing was delayed by a month, and to notify me when the website had been updated.

As with 'lineage' and 'haplogroup' for population genetics, 'carbon emissions' and 'carbon offsets' are scalar representations within climate change discourse. That is, they reduce and simplify relations between different selves and a world they share. In so doing, the generate self-objectifications that make people distant from each other in space and time (whether evolutionary ancestors or co-eval carbon emitters) comparable. For carbon offsetting, this scalar work is necessary to make possible economic exchanges related to, but distinct from, actual carbon emissions.

Scaling Down the World

In this section I discuss how the Genographic Project and the Carbon Lottery construct representations of human relations to the evolutionary past and the future of the climate. In both cases, comprehensible self-objectifications are made possible because of a pragmatics of scale that reduces the diversity and complexity of ecological processes. This not only contributes to the growth of capitalist exchanges, but also potentially reinforces ideologies of human difference.

At the same time, these self-objectifications are described as contributing to universal progress, that is, gaining scientific knowledge of human origins, the past we all came from, and stopping climate change and worldwide extinction, the future we are all destined for.

Haplogroups Scale Down Human Evolution

Personalised genomics are able to produce estimates of ancestry based on haplogroup. Because Haplogroup is itself an unfamiliar abstraction, the pragmatics of scale is necessary to render it comprehensible. The website also provides complementary information that associates a decontextualised genetic fragment of the user to impersonal evolutionary scales through evocative visuals, especially icons and maps.

Haplogroup lineages are an abstraction from the totality of human evolutionary history. They are based on genetic markers, isolatable fragments of a person's overall genome. My 'Maternal Line' was characterised as 'Haplogroup 'H', listed beside a generic silhouette of a woman walking. Comparisons are necessary to position a user in relation to haplogroup distinctions with which they are likely unfamiliar. To aid in this, the site claimed that Haplogroup H is shared by 33.5% of all other participants. This scales up my genetic data by relating it to hundreds of thousands of others, who are meant to stand in for the genetic diversity of humanity as a whole.

One is further invited to 'Explore Your Results' as well as 'Upgrade to the Next Generation' of genomic evaluation (available for purchase for an additional $199.95). Users are encouraged to purchase this new generation Kit in many places, but it is not necessary to learn preliminary results. The 'Explore Your Results' tab leads the user to the main area where they may explore 'Your Deep Ancestry' listed in parentheses as '1,000 Years - 100,000 Years Ago'.

Evolutionary scales are made further comprehensible through visuals that depict a journey across a map (see Figure 2). The map remains at the top of the page, directly below it is a line that moves from left to right, listing different moments of human haplogroup mutation ending with the group belonging to the user. This collapses evolutionary time in a visually clear way. That time becomes a series of arrows risks equating evolutionary change with migratory movement. A design choice concerning scalar depiction, in this way, contains potentially unintended assumptions encouraging users to conflate distance travelled with genetic change.

FIGURE TWO: My Genetic Journey produced for me by the Genographic Project

This scalar trope is repeated when the ancestral line is further divided into a more distant 'Root' and a more recent 'Branch'. In my case, my ancestry was visualised on this line as proceeding from L3 to N to R to RO (the four Haplogroups of my 'Root') to HV and ending at H (the two Haplogroups of my 'Branch'). By pressing these nodes with their cursor, I could alter the map, which revealed, with each passing stage, the migration of specific lineages out from Africa and throughout the world. As written on the website: 'By looking at the markers you carry, we can trace your lineage, ancestor by ancestry, to reveal the path they traveled as they moved out of Africa.' Once again, this assumes that one's ancestors did, in fact, move out of Africa (indicating a non-African user, in my case correctly). Non-African users may indeed be the primary customers for Genographic Project kits, but this suggests an unmarked global standard, that of the migrating human, as opposed to the comparatively stationary African.

There are two ways to navigate this map. One can read the text below the line which explains how to interpret the map and the segments that gave rise to the lineage depicted. For example, my lineage is described in successive pages as having belonged to Branch L3 '67,000 Years Ago', Branch N 'About 60,000 Years Ago', Branch R 'About 55,000 Years Ago' and so on. Accompanying each Branch is the Location of Origin, including East Africa (L3), East Africa or Asia (N) and West Asia (R, RO, HV and H).

Also included on each page are one or more photographs of contemporary exemplars of this Branch from the regions under discussion. Accompanying each is a description of path of global migration the group might have followed, the landscape of their location of origin and their contemporary distribution. Given the genealogical visualisation of branches and roots, associating deep time with distance across space, the accompanying photos and descriptions of contemporary populations can give the impression that members of an ancestral halpogroup have remained unchanged for tens of thousands of years.

Combining global maps and evolutionary time is part of the pragmatics of scale by which comprehensible representations are produced for users of the Genographic Project. For each haplogroup, the Branch descriptions also rely on my familiarity with geography. While the map that is navigated with each marker lacks national borders, the descriptions routinely call upon the empty, homogeneous space-time of imagined communities of national and continental groups in order to make geographic distributions comprehensible.

For example, members of the RO haplogroup are said to have 'moved north across the Caucasus Mountains and west across Anatolia into Europe'. This geographical explanation is followed by a brief reference to human evolutionary history: 'These were Cro-Magnon. Their arrival in Europe heralded the end of the Neanderthals' and a discussion of contemporary location and distribution: 'Today, members of this lineage are present around the Red Sea and widely throughout the region'. However, the description of RO ends with a claim about individuals with the RO marker from non-European imagined communities that deviate from the general migration out of Africa: 'While this genetic lineage is common in Ethiopia and Somalia', the site explained, 'individuals from this group are present at the highest frequency in Arabia. Those living in East Africa are the likely result of more recent migrations back into the continent.'

The progressive movement of ancestors across a familiar geo-political map, revealed by the mutation of genetic markers in six haplogroups, collapses deep evolutionary scales in a

visually accessible way. In this way, I was able to comprehend thousands of miles and tens of thousands of years as a series of arrows on successive maps. Also supporting this pragmatics of scale are taken-for-granted distinctions between geographical features, populations, and imagined communities, which purportedly aim to convey a story of one's ancestry in a relatable way, but end up relying upon and reproducing divisions of the world and its people.

Carbon Footprints Scale Down Climate Change

How individual actions create climate change, or arguably any environmental crisis, is difficult to comprehend. Like the Genographic Project, the Carbon Lottery seeks to produce relatable self-objectifications that distinguish and reduce particular features in order to make different people and activities comparable across time and space. A key component of this pragmatics of scale, carbon calculators isolate specific aspects of the participant's life, estimating the specific amount of tonnes of carbon created by each aspect. They then add them together to create an overall calculation of the participant's carbon footprint. In so doing, they scale down climatic phenomena and make them comprehensible to non-specialist users like myself. Scalar work, in this way, also serves the purpose of inviting users to both gamble for wealth and achieve environmental sustainability.

The first category of the Carbon Lottery carbon calculator ('Home') required that I select my country of residence and type of dwelling, including how many bedrooms and occupants and whether or not it had air conditioning. The second ('Motor Vehicle') asked me to indicate how many kilometres or miles I drive on average per year and the kind of vehicle ('Hybrid', 'Hybrid Sedan', 'Small Car', 'Medium Car', 'Large Car/Minivan', 'SUV/Truck'). The third ('Diet') asked for how many 'servings' of different food groups ('Red Meat', 'Poultry', 'Dairy', 'Seafood', 'Cereals & Grains', and 'Fruits', 'Nuts & Vegs'). The final category ('Flights') asked how many one-way flights I took on an average year, breaking them down by length ('<1.5 hrs', '1.5-4 hrs', '4-6 hrs', '6-12 hrs', and '>12 hrs'). The categories of the carbon calculator abstract specific elements of my existence from one another in order to make claims about my overall carbon footprint. Regardless of the accuracy of these estimates, they also break down climate change into familiar, everyday practices and objects that most people can readily identify and select responses to.

While the estimated tonnes of carbon the calculator provides does not guarantee that I could neutralise my emissions, it attempts to persuade users like myself that I do so in at least three ways.

First, the carbon footprint is offered as a synecdoche of a person's overall impact on the amount of carbon dioxide in the Earth's atmosphere and, therefore, an objectification, in tonnes of carbon, of their individual relationship to climate change as an overall process. With a debt to the environment thus individualised, it is easier to comprehend one's individual responsibility for what otherwise is an impersonal and global process. Though this might just as easily persuade those so inclined to alter their practices of consumption and ownership and lessen their emissions, no information was provided on the Carbon Lottery website that might encourage them to address their objectified debt in this fashion.

While made personally responsible for a specific fraction of emissions, I was also shown that the cost of offsetting this amount is relatively small. This makes the carbon lottery comprehensible in another sense. In my case, it was recommend that I purchase 18 tickets (or four offset certificates good for 1800 Kilograms offset). Since the tickets cost 2 pounds each, I paid 36 pounds to enter one drawing for up to 4 million Euros and offset a year's worth of my

carbon emissions. Not only was the cost of offsetting my debt to the climate relatively small, in other words, but the potential reward for doing so was incredibly high.

Carbon trading is thus made comprehensible in clear cost-benefit terms, which is perhaps the most relatable dimension of the pragmatics of scale associated with the Carbon Lottery. If the Genographic Project relies on a user's familiarity with maps and arrows, as icons of change and movement, then the Carbon Lottery relies on general familiarity with the operation of lottery systems.

Lotteries similarly involve a scalar dimension, insofar as many people are simultaneously individualised, as players, and related to one another in a system of cost and benefit. The carbon offset certificate is an instrument of such individualisation, as are the particular (and possibly winning) numbers they contain. Such a clear depiction of indiviualised risk and reward is typically lacking in environmental crises, which the Carbon Lottery sought to change. The particular economic circumstances of lottery players is of no account in its operation, and the particular environmental circumstances of carbon offsetters is also not important so long as they can be translated into a market where some are sellers and others buyers.

A third and final source of persuasion, invokes the empty, homogeneous scale of the imagined community of the nation (Anderson, 1991), in my case the United Kingdom. Once selected, an icon of the British Union Jack appeared, accompanied by a national average of carbon emissions, estimated as '10.6 Tonnes CO2e p/a'. Given that my carbon emissions were estimated at '1.8' Tonnes, this might reduce my motivation to 'neutralise' my emissions. After all, my lack of a motor vehicle, my small apartment, and my diet placed my emissions far below the estimated national average. And yet, it could also be the case that those so close to 'zero' emissions would be more inclined to address the climate debt that remains. This was certainly true in my case.

Each of these sources of persuasion rely on individualising carbon emitters, who become anonymised and unmarked members of the national and/or global standard. With no other frame of reference except the average emissions of other people in the same nation, this individualisation of one's carbon debt arguably distracts users from the socio-economic totality within which their emissions occur. My modest carbon emissions were largely attributable to my relatively higher social class, for example, my ability to afford a better diet, whereas my greatest source of emissions, my frequent international flights, had more to do with the peculiarity of international conference attendance and the precarity of the academic job market. Moreover, the impact of large, industrial emitters on climate change far exceeds that of most individuals and businesses, regardless of class. All of these factors are removed from consideration in order to produce a scaleable estimate of carbon emissions, one that makes my actions formally comparable with other carbon emitters, anywhere in the world. The technical expertise necessary for this scalar comparison converts calculable emissions into fungible knowledge assets.

Those global relationships that are referred to are done so selectively and partially. There is an implicit contrast between lottery players, whose carbon emissions have been calculated, and people paid to offset their emissions, who become exceptional and non-standard by contrast. Offsetting projects in the global south were listed on the now defunct website. In the first Carbon Lottery drawing on the 26 April 2011, for instance, the announcer mentioned a 'featured offset project' in Brazil where fossil fuels are replaced which recyclable materials. This, it was claimed, both reduced the site's carbon footprint and created jobs for local residents. These activities were depicted in short video clips in the corner of the screen, which were not referred to or further

explained, except on the site itself (though even there the descriptions were short, and the process of monitoring and verification that creates these knowledge assets left unexplained).

The images and explanations serve to position the development projects and their practitioners as critically different from the carbon-emitting user of the site, which provides the justification for the donation they have made. It is only because they have been put into a relationship with these other people and places that users like myself can be told that climate change is being solved whether they win or not. Developing countries, with verified sustainable offset projects to invest in, make it so everyone is a winner. And yet, as a user I was aware of paying into the Carbon Lottery on behalf of these countries, rather than the carbon-offsetters directly. If Brazilians are the metaphorical owners of some desirable asset, carbon offsetting, it is only through the mediating scalar practices of various experts that this asset appears as such for the sake of my self-objectification as a responsible carbon emitter.

The Limits of Scaleability

In this section I compare the limits of scaleability of the two projects, drawing on the work of Tsing (2015). Personal genomics and carbon offsetting practices endeavour to make complex, ecological processes comprehensible with scaleable calculations of ancestry and sustainability, respectively, often to salvage the latter for further financialisation as knowledge assets. Both initiatives also obscure the inequality that underlies these exchanges in information and wealth.

Self-objectification and Economic Exchange

As Gal (2016) and Irvine (2016) argue, scalar work is partial and ideological by necessity. Only by selecting for particular, quantifiable features can scaled up models of self-world relations be estimated with any kind of reliable precision. Haplogroups and carbon footprints simplify the complexity of human relationships to the world. Instead of the totality of the genome, specific genetic markers are isolated that represent distinct lineages (maternal or paternal) and stand in for the entirety of one's evolutionary inheritance. Instead of the totality of carbon-emitting activities, specific consumer habits are isolated that represent distinct sources of carbon emissions and stand in for the entirety of one's impact on global climate change.

Like their predecessors, both projects also made prior decisions about whose bodies and actions could be transformed into desirable assets by dividing up the world and its people in familiar ways. The exchange of money further mystifies the complexities that underlie scaleable representations of haplogroups and carbon footprints. According to the familiar dynamics of capitalist exchange, what I paid for as a user was the value of the expert labour required to manipulate bio-resources to determine ancestry and offset carbon. The Genographic Project and Carbon Lottery add to this process of capital accumulation the guarantee that a portion of the excess profits collected from services provided will go to employ and assist primarily non-western and indigenous others. But this account is limited in that it presumes that the knowledge assets pre-exist the intervention of legal and financial regimes. This becomes a form of rent-seeking because these payments are not primarily philanthropic, but rather they are the added cost of developing knowledge assets and objectifiying them into tradable property. The supposed generativity of genetic makeups and carbon emissions, of which some people are retroactively regarded as the metaphorical owners, cannot be realised as an asset without this investment of the technical, legal and financial expertise that make carbon trading and personalised genomics possible at a global level.

The expertise of the carbon broker/population geneticist may produce financial value, but their expertise is of no account if they cannot first acquire rights to translate cheek cells, sustainable projects into scaleable and salable products (e.g. ancestral data, carbon offsets). The amateur genealogist/off-setter may be privileged when compared to non-western and indigenous others, but what they share in common is that neither own the circulating assets derived from their bodies and actions. Their self-objectifications may become consumable as ancestral maps and carbon footprints, but they do not own them, anymore than they own the online platforms where they are displayed. Whether people are paid for this metaphorical ownership or not, they are all merely consumers of technically mediated information, not owners of assets. It is only brokers and geneticists, and, more specifically, the firms that employ them, that can own, trade, and speculate upon these knowledge assets for the purposes of financial gain and scientific discovery.

No matter their other claims, in terms of what they provide to the general user, the Genographic Project and Carbon Lottery focus most of their attention on providing a scaleable account of a self's relationship to human evolution or climate change, respectively. What underlies their ability to do so is a global division of metaphorical ownership and a legal regime backing rights in intellectual property. Experts can only make available authoritative accounts of human identity and difference by first acquiring ownership of genomic diversity and affordable carbon mitigation as technical and legal ideas rather than commodities in the traditional sense (Birch and Tyfield, 2013). Even if a better understanding of the diversity of the human genome may one day cure diseases, even if a sustainable business operation will build eco-friendly products, these potential outputs are of no account. It is not their potential use value in the future that is important, but their transformation into resources to be owned, traded, and speculated upon in the present.

Divisions of Metaphorical Ownership

In addition to enrolling human differences into assets for exchange, both projects exclude any mention of these global processes from the information provided to users of their sites. This includes the networks and processes by which DNA is identified and collected, or by which additionality of carbon mitigation is demonstrated and certified. Elite consumers like myself interested in determining their ancestry or offsetting their carbon emissions pay for the privilege of having their material products and practices objectified and made comprehensible. But the complementary transaction by which products and practices are paid for is left generally vague or is entirely excluded from site designs.

The representations offered by these initiatives do not make clear, for instance, how non-western and indigenous people are compensated for the acquisition of rights to their products and practices, which are considered more valuable assets in comparison. To discover more about this promised compensation, often presented more as a gift than a payment, one must go outside the carefully curated platforms presented to users and explore the wider publications and grey literature associated with population genetics and carbon offsetting. Non-western and indigenous communities are generically represented as in need, in keeping with depictions of the world as naturally divided into subaltern and superior, those with resources to spare and those with the expertise and the financial and legal institutional backing to turn it into property.

It is as a result of their valuation as assets that non-western and indigenous resources are thought worthy of investment. It is for this reason that I pay to offset my carbon or to analyse my DNA, while non-western others are paid. This not only obscures the co-production of bodies and

environments, it naturalises the ideological division according to which some parts of the world are thought more abundant with resources, with rare DNA and preindustrial landscapes, which a few, elite governments and firms are allowed to own, manage, and derive rents.

On both platforms, this territorial division of metaphorical ownership goes largely unacknowledged. They receive the least attention in the promotional materials of both sites. But why is it, for example, that indigenous Scottish DNA or boreal Canadian forests are less valuable than their southern counterparts? This global divide between standard and exceptional assets is presumed rather than historically explained.

Conclusion

One could argue that the tendencies I have identified in both projects are inherent to the scalar work and ideological assumptions of carbon trading and personalised genomics and the knowledge claims associated with them. At the same time, one can imagine changes in design that draw attention to these relationships. This would not address the inevitably partial and reductive representations of such initiatives, necessarily, but it would potentially facilitate improved dialogue and debate. This would require drawing attention to the influence of capitalism and imperialism on the division of the world into north and south, settled and indigenous, owner and producer, and the distinct yet complementary valuations of biological assets ushering from these geo-historical relations. The alternative cannot help but reaffirm a vision of the world as naturally unequal, and to create self-objectifications of the privileged from distorted reflections of global others.

The Genographic Project and Carbon Lottery both facilitate exchanges of money and information. To achieve their aims, they therefore must produce self-objectifications that reconcile the scalar complexity of human-world relationships with abstract and reductive features (e.g., carbon emissions, genetic markers) that stand in for those relationships. It is important and necessary to find new ways to represent complex, global processes, like climate change and evolution, so that they might be made comprehensible to various publics outside scientific practitioners and political representatives. But it is also important and necessary to call into question the scientific and political merit of particular personal genomics and carbon offsetting initiatives, precisely so that they can be better designed to take into account the unequal histories that have shaped the selves and world(s) they seek to represent.

The examples selected for this argument provide interesting models for how to downscale what are otherwise difficult models of the world with which to relate. Both do this by incorporating a pragmatics of scale that translates selves into quantifiable and comparable units within a global system of information and monetary exchange.

They do not use just any self for this purpose, however, but share a focus on an individual, self-objectified with techno-scientific precision. I have argued that by paying attention to these scalar processes as self-objectifying, we can identify how they frame the diversity and complexity of bodies and environments out of which evolved-beings and carbon emissions both emerge. More specifically, by understanding sustainable carbon offsetting projects and rare genomic samples as part of inequities of capitalist exchange, it becomes clear that these abstractions work by trading money for information which, only in the hands of the right owners, is thought to have the speculative potential for climate change mitigation and knowledge about human origins.

And these initiatives do not use just any model of the whole world to perform their scalar work. The world they rely upon is profoundly unequal as are the politics of difference used to

study and change it. This becomes clear by paying attention to the historical processes by which categorical divisions of the world reflect imperial geo-historical divisions of power and wealth (Coronil, 1996).

Putting these ideas together, one can see how the uneven supply of and demand for knowledge assets are premised upon an unequal world and how the dissimulation of this inequality, and its origins, threatens to make the world more unequal. A territorial division of metaphorical ownership results, whereby those identified as potentially more carbon neutral or genetically rare are encouraged to sell rights to virtual representations of their activities and bodies to those more privileged and classified in the opposite way. Both initiatives rely on overlapping divisions of non-western/western, indigenous/non-indigenous, wealthy/poor, which they use to determine who pays and who is paid for their virtual resources. My genetic markers and environmental practices, for example, are only made significant in relation to the more valuable virtual assets of these others, and are less valuable by comparison.

A further consequence of these global divisions is the unequal ability to represent oneself and the world. As long as users of these scalar practices are not made aware of the inequalities that make possible western self-objectification, they are scaled up to relate to a world they understand less well and have made worse. Rewarding non-western and indigenous people for their virtual assets may be philanthropic, depending on how it is managed, but it also threatens to reaffirm their status as subalterns in need of saving by the superior knowledge and means of western offsetters and genealogists. They not only lack the technical skills and legal regime to translate their materials and practices into salable information, they also do not own the knowledge assets so created. This is especially troubling because the authoritative accounts of non-western and indigenous bodies and environments, which increasingly circulate around the world as *virtual* representations, are in danger of returning to impact their *actual* rights and struggles (see TallBear 2013). For indigenous people, in particular, this may raise the spectre of a return to social domination by non-native powers, empowered with the neo-colonial argument that indigenous lives and landscapes are too important *for humanity* to be left in their hands alone.

This is concerning at a time when claims are increasingly being made, especially by governments and corporations, for exclusive ownership of virtual and intellectual property (Hart, 2005: 82-83). Yet, one could imagine people throughout the world swapping information about their bodies and how they live, expanding one another's sense of their shared past and future, without the involvement of transnational legal and financial regimes. They would still likely require mid-level technical expertise to translate these exchanges into meaningful representations or self-objectifications, but that does not automatically necessitate the interference of dominant legal instruments and corporate power.

One could further imagine people engaged in another form of two-way exchange, whether of carbon offsets or genetic markers, where all parties are empowered to creatively produce the results, rather than bracketed out as merely passive and metaphorical owners. The online platforms that currently exist for this purpose provide little in the way of two-way, co-production of which online economies are capable. Alternative designs could experiment with scalar representations that highlight global inequality and diversity. There is no reason, in principle, that platforms designed to express complex relationships between human beings and evolutionary and climatic processes, cannot pay equal attention to the complexity of the profoundly unequal world we share.

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