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Mapping the Disaster: Global Prediction and the Medium of 'Digital Earth'

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Abstract

This paper explores the mapping of disaster in digital prediction models. Concentrating on the imminent disaster of climate change, the author asks how global digital models can be expanded to incorporate a wild nature and wild data. This theme is considered through an examination of the 'nature' of disaster and its reportage, GISs and their extension into physical space, the language of climate change, and the role of digital machines in these experiments with climate. The author concludes with an examination of expanded forms of mapping to suggest possible reconfigurations of the terms of the disaster.

Introduction

"The infiniteness of the threat has in some way broken every limit. We are on the edge of disaster without being able to situate it in the future" [1].

"The tradition of the oppressed teaches us that "the state of emergency" in which we live is not the exception but the rule" [2].

The disaster is excessive. It is the event of wild data. Like Rene Char's assertion, the disaster has a wild nature, it is "all that separates itself convulsively from the unity of the world . . . and lands on us at full speed" [3]. The impending and actual disasters of our time are the collapse of human habitats through extreme climate change. The medium of disaster prediction and reporting are more often than not the geographical information systems (GISs) that map and simulate the globe through digital models. The accumulation of GIS data, taken together as an assemblage of digital earth values, can be referred to as a model of 'Digital Earth'. Digital Earth as a concept provides a suitable metaphor for the assemblage of GISs (geography, geosciences, geolibraries) and forms of remote sensing that are overlaid to provide global models of earth systems. It is through these models of digital earth that disasters are predicted, projected, managed and conceptualised. Here, in these real and modelled disasters, digital life and a wild nature collide.

Disaster is built on the exchanges between the digital and the physical. We watch disasters on TV. Disasters are predicted through computer modelling. The cultures of consumption that characterize our digital life — that anticipate and participate in the disaster — are configured in the digital sphere. GISs build the architecture of public space; stock market indices regulate the price of oil; wood is brought and sold; atmospheres are changed; forest are cut down; mud slips; land slides; and the disaster strikes. Maurice Blanchot writes the disaster as an interruption; that which is irreconcilable with a consistent medium of exchange. Its power to strike ("at full speed") derives from its simultaneity, but difference with the fabric of time and conditions of place that it tears apart. The moment, Blanchot argues, of its becoming is not the result of a progressive development or the accumulation of data, the disaster "has the irregularity of chance" [4]. The machine has to simulate the disaster, but disaster is never a scenario and this is the key disjuncture between the wild disaster and the mapped disaster. Unable to properly situate the disaster in the future, the mapping rationale of 'Digital Earth' [5] is based on the constant accumulation of data — an evolving model of the most recent earth values.

GISs form a mantle and atmosphere of data that is in constant transmission with Earth's matter. Within this transmission, data coalesces into models to form a medium of prediction — of weather, events, and scenarios. Thus, digital earth is both a medium of transmission and of prediction. The biggest prediction scenario, requiring the capacity of a super computer, is that of the global Climate Change Projection Model at the Hadley Centre, England. Incorporating data streams from the Antarctic to the Arctic, from deep sea beds to the upper atmosphere, this model earth is at once digital and organic. This is because the data is always implicated in, subject to, and transferred through the earth's organic processes. Global climate change prediction models spell disaster scenarios of increasingly unstable climate fluctuations, and in doing so they re-inscribe the wild through rational economies of digital exchange.

The rational reporting of satellite and remote-sensing data is suggestive of a 'predictive planet', yet disaster informs the limits of such reporting and the impediment of its communication. The disaster is something that Blanchot comments cannot be situated in the future, and thus its location is literally unhomed and untimely. Digital earth both reports and operates in this field of disaster, and the precariously placed systems of reporting that attempt to capture information are not immune from the attack that disaster forces — satellites crash, systems fail and informational black holes are formed [6]. In the disaster both physical landscapes and informational landscapes are ruptured.

As Blanchot comments, "The disaster alone holds mastery at a distance" [7]. This excess that the disaster highlights within information exchange signals the entropic forces at work in both digital and organic earth. It is an excessive information field for two reasons; firstly, because digital earth reports at the edge of dynamic events and its signals are sent back long after the scene has been fled; secondly, because the information that is sent will always be subject to the entropic forces of time (the message comes too late for some, in the case of the recent Indian Ocean tsunami, or in advance of the event, prediction necessarily has to rely on an 'art of guessing'). Digital earth does not exclude the possibility of wildness, the streams of earth value data form a history of a wild earth, yet what is unpredictable is the wildness of future events. Wildness can be characterized as eruptions that occur beyond, through and in the data. This wild data is one of the unexpected emergent properties of a complex model that attempts to mimic the earth's unexpected feedbacks. The furthest expression of this wildness is the disaster, which as Blanchot comments has, "broken every limit". If, following Blanchot we concede that the disaster represents a profound alterity — something 'outside' or wild, in excess of the existing conditions of time and space — we might ask what 'chance' has the medium of digital earth to predict disaster, when it has not yet learnt to work with this wild nature, and within the entropic forces of its own nature?

For Blanchot, the disaster is a concept held at the limit of its own possibility. And as such, writing the disaster is a constant negotiation with the drifting debris that is left in its wake. It is unknown "as the intense, silent and

disastrous affirmation of the outside" [8]. Similarly, disaster on a global scale compels attention, yet it simultaneously signals the limits of an impossible project of perception. The disaster has what Nigel Clark calls an 'abysmal alterity' [9]; it is the force of the global visiting the local; it is the model made immediate. A model of such a dynamic and unpredictable globality challenges any rational system, and the digital is no exception. That is to say, that the globe and global forces (of which climate is one) cannot be accommodated in their entirety. Much like Lewis Carroll's map of the world on the scale of 1:1, it was a document of the useless in so much as it defied perception and usability. In the end the non-representational world provided a much better navigational tool. So what models can we use to account for global forces of environmental change that situate us in a proper relation with the disaster? We have always had models of the world, that we shrink, expand and telescope our ideas through, yet those very objects in their mimetic relation suggest an alterity that is beyond reach, however capricious our accumulation. The alterity that Blanchot talks of is truly beyond reach, but part of our embedded contract with a global responsibility requires of us to reach toward that space, and these models of the world extend one dimension of that grasp.

The risk associated with this global alterity, in the form of global climate change, establishes the conditions of response and responsibility on which we proceed. True responsibility, as conceived by Emmanuel Levinas, is always excessive [10], that is to say that the conditions of response to such a disaster cannot rely on an already determined knowledge. Yet the tools that we have in a state of disaster, and in anticipation of being productive of a state of disaster (through climate change) are those GISs that predict, project and perform in advance to procure the possibilities of an informed response before the disaster strikes. In the wake of disasters such as the Indian Ocean tsunami, we may look for inadequate models of unfairly distributed fields of reporting or technologies. Critical of how global reporting reinforces the social-economic divisions that are driven by the national, social, cultural, physical borders that regulate global flows (ironically it is these very borders that are given up in the state of disaster). Or more accurately, the informational and bureaucratic flows that impede the message getting through. Yet, however limited this data and its communication is, it forms the limit of our understanding, and thus conditions our global relation. Through this informational exchange we try to regulate and respond to the vagaries of a dynamic earth.

The 'Nature' of Disaster and its Reportage

The climate change projection model is an augmentation laboratory that takes account of the disaster in so much as it tries to prefigure it. When predicting the modalities of the earth, most models follow the same methodology, consisting of producing a unit response that is then convolved with the appropriate surfaces into a landscape. These models take into account the whole earth and are generally spherical, mapping from the global to the local. Thus, the partial layers and localities of GISs originate from a global imaginary. A mapping system that attempts to translate earth processes into data needs not only to be constantly responsive to a changing flow of data, but to be able to perceive a mental model of the earth from which that data comes. As the artist Robert Smithson comments about the 'world as map', "A sense of the earth as a map undergoing disruption leads the artist to the realization that nothing is certain or formal. Language itself becomes mountains of symbolic debris" [11]. As we establish a model of the earth it becomes crucial not only to be aware of how effective data can be procured from the earth, but also how the very language that we use to conceptualize such a model of the earth is employed. Reading the data of climate prediction models must involve not an ever-increasing flow of data, but an intelligent accumulation of perception that is based on an appropriate 'model of the world' — a model that, in light of the disaster, writes at the limit of that comprehension.

Michael Goodchild comments that, "Geographic Information Systems (GIS) software has evolved largely in the absence of any widely accepted body of theory or concept, with each vendor adopting a distinct terminology and set of data format standards, and with each product forming the nucleus of its own informational

community. Transformations between standards are difficult, and large costs are incurred in retraining users from one system to another, or in converting data" [12]. While the recent emergence of digital earth projects have seen the 'translation' of those community values into a common set of global codes (such as the Climate Change Projection Model and Google Earth) there has been little corresponding discussion of the theoretical or conceptual basis of those codes. As digital earth forms a new global concept and metaphor for conceiving of geographic information, the form of those informational models (as a new kind of globe) have had little attention.

Geographic information has been traditionally defined as information about the distribution of phenomena on the surface of the Earth "as a commodity that is independent of the media on which it is stored, communicated, and used, and of the structures and models used to represent it" [13]. But as Michael Taussig argues, the senses are "bound to their object as much as to their organ of reception" in which "seeing becomes seeing something" [14]. He argues that it is just this something that puts the study of discourse (or medium) in a new light and raises doubts to the notion "of 'studying' innocent in its unwinking ocularity" [15]. Daniel Sui argues that GISs should now be viewed as a medium that impose their own logic of exchange [16]. In a broader sense, it could be argued that GISs are the commodity of Earth values exchanged between users, from insurance companies to local activist groups. The medium of GIS expands into a medium of landscape. Social space and flows, of people, cars, oil, materials, goods, waste, war and information are all organized around the use of GISs. From the placement of shopping malls to the timing of the stop lights, from the insurance industries that predict weather disaster scenarios to smart missiles, GISs structure and build both digital and physical spaces. The building of information in digital space extends out into the landscape to transform its physical, social and cultural architecture. These GIS infrastructures and global super structures link the digital space and physical space around the built forms of this data.

GISs are being recognized as increasingly important in the spatial and social formations of everyday life such that the search engine Google recently launched Google Earth data service. Google Earth Fusion integrates geo data, acting as an interface across datasets. It claims: "Google Earth makes businesses and governments more effective and efficient across a wide range of applications. From commercial real estate site selection to homeland security disaster response, Google Earth helps make location related decisions better and faster" [17]. Google Earth provides a stark reminder of how the formation of information in GISs takes on social and cultural forms that exceed mere quantitative accumulation to establish the perceived conditions of safety in the world. While the disaster is the most extreme case of this safety, as Walter Benjamin reminds us, the state of emergency is the rule not the exception. As climate change forces increasingly unpredictable global 'states of emergency' on us, these 'location related decisions' will be instrumental in organizing the conditions of the disaster; both in terms of who has the power to organize themselves in the light of that knowledge and the how we comprehend the disaster through the assemblages of geographical reportage. Beyond this reportage we must move to consider how these GISs are inculcated in both 'natural' and 'man-made' disasters, to recognize that the extension of digital life through and in social space removes the possibility of proposing such artificial divides.

At the meeting of the International Symposium on Disaster Reduction and Global Environmental Change [18] that included major international scientific research programs from 17 countries, 1 of the 2 key points identified about disaster was the increasing evidence that global environmental change and natural disasters are linked. The Report from International Symposium on Disaster Reduction and Global Environmental Change (ISDR & EC) suggests;

> "Future trends with regard to natural disasters are expected to be non-linear, featuring critical thresholds caused by abrupt changes in earth system dynamics. Extreme weather events having particularly severe impacts on certain regions of the world are likely to increase… [and] will increase

> people's vulnerability to extreme events such as hurricanes, coastline flooding, droughts, wildland fires, river floods and famine" [19].

The group recommends that the first point of action should be to link disaster reduction and global environmental change and improve the capacity of the social and economic sciences to undertake global monitoring of the human aspects of disaster reduction. They assert: "Integrating a monitoring system of this kind with the well-established observation systems of the natural sciences will generate a new dimension of the predictive data, giving decision-makers further insight into how to effectively reduce vulnerability" [20]. This indicates the need for a consideration of the cultural and human geographies that characterise the uses of digital systems as an integral part of managing the disaster. At a local level these considerations might include the systems of knowledge sharing in remote regions; at a global level they might embrace a consideration of the form of our digital earth.

The report noted that losses associated with natural disasters are growing globally. The death toll is estimated to reach an average of 100,000 lives a year (as of 2050) with more than 97% of casualties suffered in developing countries [21]. Such is the scale of disasters that the Red Cross estimated that 1998 was the first year in which the number of people being displaced from environmental disasters exceeded those displaced by war. By 2050 global economic losses caused by natural disasters was expected to top $300 billion annually "if no breakthrough in disaster prevention, disaster adaptation and risk reduction can be achieved" [22]. The disproportionality of disaster and disaster prediction reporting indicates that the visiting of disaster has a directly inverse relation to the reporting capacities of countries — what we might call a localized capacity for utilizing the predictive capacity of 'digital life'. Such a lopsided globe can be found in Google's digital earth, where 99% of the datasets are present for North America and Europe, compared to virtually absent data sets for Africa and India. The call has been for the establishment of a global early warning system under the auspices of the UN, but for this to be effective there would have to be a radical reconceptualization of the reaches of 'digital life' into the poorest and most vulnerable regions of the world. And as disaster forces its way onto the political, scientific and economic agenda, it should also be considered on a cultural agenda, because the models of the world that are used to establish the conceptualization of disaster bear upon the possibilities of its cognition. By expanding the modalities of thinking about digital earth to consider what kind of globes this exchange of earth values makes, we might take account of the medium of GIS and their role in our experiments with climate change.

Experiments in Climate Change [23]

Climate change could be considered a human experiment with the earth's 'available materials'; with atmospheres, carbon and fossil fuels; and with the forms of information and intelligence used to comprehend the experiment. At the limit of this potential field of disaster, digital information is subject to the phenomena of the materials it is designed to track. For example, in 2000 the space insurance industry and the TSUNAMI fund put up £120,000 into research projects examining the role of space weather in satellite failures. Scientists from Mullard Space Science Laboratory (MSSL) and British Antarctic Survey (BAS) attempted to examine the role of violent space weather in satellite failures [24]. While the project is intended to help space insurers minimize losses and set premiums, it serves as an example of how the instruments of reporting operate simultaneously in a digital and physical field of information transfer. Data processing acts on and acts with earth systems to produce the image of digital earth and this calls for an expanded mode of engagement with the process of collaboration between dynamic earth systems and the operation of digital systems in the wild.

The disaster is reported on and operated on in the realm of the digital, but it is foremost an experience (of technology) and the anticipation of an on-coming experience. If we think of those watching the recent Indian Ocean tsunami develop in meteorological offices around the world, anticipating what this data will unleash on the unwilling participants that stand and fall in its course, the experiential quality of this information is most apparent. The experience of technology is also the experience of the observer at the atrocity and that of the imagined atrocity that will have to be borne by others as an experience [25]. In a wider field of consideration, environmental disaster can be considered as a disaster of aesthetics; a failure to act on and participate with a reciprocal ethic of sensory involvement with the world, which has led to a fracture in how we relate to our wider environments. It is the very displacement of aesthetics into the technological realm that has participated in such a failure [26]. Ironically, what the disaster of climate change offers is a return to a form of becoming that is experiential and profoundly geographic.

Ideas of the reportage of simple cause and effect in climate modeling are a diversionary tactic, instead it is the very technology of these matters that requires attention: the technologies of carbon and the technologies of reporting on the experiment with carbon (both the models of climate change and the culture of those media ecologies). Technology is both a collaborator and instigator in these carbon experiments, and so we require an appreciation of technology that expands beyond the efficiency of instruments to consider the experiences and aesthetic imaginaries that are the product of technology. It is the very energy-burst of disaster that is both distraction (as the politics become a form of theatre) and a very real arrival (that unleashes the possibilities of response and responsibility). The distraction of the disaster is to amplify the unusual quality of the event and thus remove it from the everyday into the realm of the exceptional. From such a place the disaster is mute, a form of displacement of the excess, that is unpredictable and thus unplaceable in a rational economy. While the popular media cover the sensationalism of disaster, the front cover of the International Symposium on Disaster Reduction declares “From a culture of reaction to a culture of prevention: Joining forces for a sustainable development”, thus conceiving of the very conditions of sustainability in terms of disaster management. The disaster is now comprehended as the rule not the exception.

The Language of Change

The Hadley Centre’s report summarizing the relevant research on climate change is entitled, “Stabilizing climate to avoid dangerous climate change” [27]. One of its main aims is to use climate models to simulate climate change by understanding the processes within the climate system and the development of comprehensive climate models that represent them. The representational modes of climate models on a global scale serve as an interface/or an optic to the world that takes on both political and cultural implications. Extreme climate activity has always been a space of slippage between the epic and supernatural, and the mundane and overlooked [28]. Despite enormous changes in the instrumentation and sensory powers of weather machines, weather can rarely be accurately predicted for more that seven days in advance. Because of this volatility, the tendency to conflate weather with other forces of change is an accepted part of our cultural landscape; in moral and portentous climates, industrial and economic climates. It is this very nature of a continuous landscape of exchange that atmospheres enact that promotes this seepage of weather into a condition of mind, language and information as well as an climatic event of dynamic earth processes.

Floods, earth quakes and tsunamis erupt in the same language of disaster that characterizes climate change, melting ice sheets and global warming. This conflation of events actually represents much more that a lazy exchange of language that substitutes the apocalyptic for a dynamic earth or a rhetoric of catastrophe to encompass every event that causes disarray. The ‘Summary’ on climate change begins “What constitutes ‘dangerous’ climate change, in the context of the UN Framework Convention on Climate Change, remains open to debate.” The model involves debating what constitutes dangerous; trying to locate the dangerous in rapid

change, looking for ‘triggers’ for such abrupt change (currently the Gulf Stream, the Greenland ice sheet, the carbon cycle and methane hydrates); investigating gradual change in order to define dangerous change; and considering that we could be committed to dangerous change many decades before we reach the dangerous level. The difficulties in ascertaining distinctions between the man-made and the ‘natural’, and the disaster and acceptable change as a condition of dynamic life systems, is one of the most contested areas in the politics of climate change. As the language around climate change slips in its precision, areas open up for unknowing that have been ruthlessly exploited by those with a vested interested in dismissing the strong consensus of opinion around extreme climate changes induced by man.

Conflations in the language of climate change also represent the changing metamorphosis of earth systems to incorporate and feedback to man-made factors in unexpected and challenging ways. A recent example includes the melting of the sub-Arctic region of western Siberia’s ice-covered peat bogs for the first time since the ice age (11,000 years ago) which contain billions of tons of greenhouse gas [29]. The vast expanse of western Siberia (spanning a million square kilometers) is undergoing an unprecedented thaw that could dramatically increase the rate of global warming through the release of billions of tons of methane, a greenhouse gas 20 times more potent than carbon dioxide, into the atmosphere. This area of Siberia is what climate scientists have identified as a “tipping point” — a delicate thresholds where a slight rise in the Earth's temperature can cause a dramatic change in the environment that itself triggers a far greater increase in global temperatures. The positive feedback within environments adds to global warming in unpredictable and unforeseeable ways.

Environmental feedback materializes as data feed into the supercomputer to change the parameters of the climate model. This ever-evolving model provides a continuous organism of change, adjustment and reconfiguration. As the machines of climate modeling account for the dynamic life forms of earth, by extrapolation, the model of digital earth can be thought of as a participatory meta-organism in itself, receiving and responding to climate changes and the bodily shifts of earth processes. The predictable quality of these unpredictable responses becomes ever more difficult. While climate change models are the best we have to demonstrate irrefutably the contribution of man to changing environments, they are models that are essentially designed to work with a stable idea of the environment. Because the natural and man-made disaster constitute a single system of continuous transmission and feedback with distinct ecologies of information, they can no longer be considered through binary cultural models such as that of nature-culture, nor rational concepts of the environment as digital or organic.

Gravity’s Rainbow: Reconfiguring the Terms of the Disaster

“A screaming comes across the sky. It has happened before, but there is nothing to compare it to now” [30].

The first words of Pynchon's novel *Gravity’s Rainbow* is the sound of the scream of a V-2 rocket hitting London in 1944; it is also the screams of its victims and of those who have launched it. It is a scream of the certain secret lusts that drive the planet and its inhabitants. It is the expression, transmission, and disembodiment of a message. The signal is launched, sent, and about to be received as information; an expression of the configuration of the 0 and the 1 and all that which will shatter the possibility of the artful configuration of that logic. Pynchon's characters “move forever under [the rocket]. . .as if it were the Rainbow, and they its children.” It could be said that Pynchon’s extreme imaginaries of the tension between rational systems and the irrationality they unleash provides another kind of expanded model for mapping the disaster.

On the ground, Pynchon’s characters are furtively embroiled in determining that sixth sense of perception that attempts to organise a ‘pattern of behaviour’ ahead of the arrival of the disaster. His examination of the 0 and 1, the heartbeat of digital data, in Gravity’s Rainbow clearly points to a concern for the consequences and possible

responses in a positivist scientific culture that avoids the disaster and its abysses. Working within the excess that is a product of technologically configured disasters, Pynchon considers how expanded modes of engagement when "the Grid is wide open, [and] all messages can be heard" [31] offer the possibility of reconfiguring the terms of the disaster. He suggests; "when everything has been taken care of, when nothing can go wrong, or even surprise us… something will" and this is possibly "where the salvation could be" [32]. The extra-sensory perception of Pynchon's characters, who are held in a state of expecting, waiting, and trying to gesture towards disaster, sleep on the sides of volcanoes. Their only hope of salvation from the disaster can be found in their bizarre psycho-mapping of technology's excess. What does this mean in terms of mapping the disaster? Perhaps, as Blanchot and Pynchon suggest, we need to expand our maps to write at the limit of their possible configurations, and by trying to imagine ourselves in that impossible space, we might find the conditions of responsibility and response that the disaster requires of us. This form of projection beyond the limits of our machines (but mindful of their part in the disaster) into the terrain of the disaster perhaps offers the possibility of reconfiguring the terms of the disaster — as a medium of exchange that is both digital and organic, here and there, and the shadow of whose rainbow we all now live under.

As GISs build up images through continually deposited layers of data, analogous to the layers of coal and oil, they condense information into an image economy. The conversion of materials releases new life-forms into the world: of newly envisioned sea beds and ice streams and a constantly changing image of the world and world image. Digital earth distributes, generates, manages and controls the exchange and flow of earth and atmospheric data using a variety of forms, media, hardware and software. The autonomous relay of 'independent' data is amplified in its layering to form an object/image of the earth that establishes what Denis Cosgrove calls a 'broader persuasive strategy'. It is not new to suggest that each medium imposes its own configuration and possible feedbacks to the information it carries and that all formulations of earth values include undecidable propositions, what is less certain is how digital earth and dynamic earth collaborate to allow us to configure the 'art of guessing' with respect to climate change. The challenge of coming to terms with disaster may require a new approach to the art and science of data prediction, one that builds on the existing tools and available materials to integrate new modes of collaboration between the nature of earth systems and the nature of digital life.

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". . . the highbrow hot spot of cyberspace . . . a digital bible for the lowdown on the [hi-tech] art scene." —Wired

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Nisar Keshvani, Editor-in-Chief

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Wild Nature and the Digital Life

Guest edited by **Dene Grigar and Sue Thomas**

Generative and Emergent

Locative and Performative

Wild Nature and the Digital Life Gallery

Curated by **Dene Grigar and Sue Thomas**

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