The Digital Globe and New Mediations of the Environment

11

Leon Gurevitch

On December 7th, 1972 at 18,000 miles above the earth and 5 h after launch, the crew of Apollo 17 took a photograph of the earth. Apollo 17 was the last manned mission to the moon and so the image (assigned by NASA the innocuous title 'AS17-148-22727', but later reassigned 'The Blue Marble') was not by any means the first to be taken of the earth.[1] It was, however, one of the few to show the earth fully illuminated with no terminator line and as such, made newspaper front pages upon its release. This photograph is not only interesting for the often-cited fact that it is the most 'reproduced image in history'[2] but also for the quantity and range of popular and academic comment that it has attracted.

Before the photograph even emerged from among thousands taken by NASA, the possibility of a 'whole earth photograph' was narrated in a number of ways. As Denis Cosgrove (1994: 281) has detailed, both the United States and the Soviet Union were keenly aware of the powerful propaganda potential inherent in the universalist iconography of a whole earth photograph. Even before the image was taken, commentators such as Fred Hoyle and Stuart Brand made claims of paradigm shifting cultural impacts of such a picture. Hoyle predicted in 1948 that 'Once a photograph of the Earth, taken from the outside, is available . . . a new idea as powerful as any in history will be let loose' (Redfern 2003: 1). Since its emergence in the 1970s, the discursive interpretations of *The Blue Marble* and its cultural significance have grown. The image is said to have contributed to the rise of James

[1]For more detail on the many 'first' photographs of the earth from space see Robert Poole's account of the US/Soviet space race in the book *Earthrise*: *How Man First Saw the Earth*.

[2]Both Al Gore and Wikipedia make this claim though it is not clear how this can be verified or what is its significance even if it could be.

L. Gurevitch (✉)
School of Design, Victoria University of Wellington, Wellington, Aotearoa/New Zealand
e-mail: Leon.Gurevitch@vuw.ac.nz

S.P. Mains et al. (eds.), *Mediated Geographies and Geographies of Media*,
DOI 10.1007/978-94-017-9969-0_11

Lovelock's Gaia theory[3] and with it a paradigm shift in earth sciences (Lovelock 1995, 2006), the commodification of nature within industrial culture (Haraway 1997); the materialisation of Marshal McLuhan's Global Village (Roberts 1998); the formation of a 'panhumanity' in which the global social is united by a shared human nature; a shared global culture (Franklin et al. 2000: 30) and a transformation in economic theory – based as it previously was on the notion of infinite resources (Poole 2008: 158).

Crucially, central to such discourses has been the claim that images of the earth from space alerted the public and professional spheres alike to the concept that the planet constitutes a closed, fragile and interconnected environmental system. Following on from this was the observation, now claimed by Castels (2010: 177) to be a fundamental lynch pin of twentieth century environmentalism, that the earth's ecosystems operated beyond the confines of nation state boundaries. Echoing this, successive groups of astronauts returned home from space citing the lack of identifiable national boundaries and the fragility of the earth's ecosystems as one of the most profound revelations to spring from beholding the earth in its entirety. This has led Frank White to describe their experiences, and those of humanity (once such images started to filter back) to be the result of what he calls the "overview effect" (White 1998).

Despite the great quantity of public and academic commentary that these images attracted, they have now been superseded as the primary source of representation both for the planet and for its environment. While whole earth images are not in any danger of disappearing from contemporary media circulation, the earth image that has increasingly found favour over the past decade across multiple media formats has been that of the digital earth. And though there are many alternative digital earth programs, it has been Google Earth that has gained popular and widespread public attention in years since it emerged in 2005. Its arrival, though notable across a range of public media from the personal computer to the evening television news, has still not received the quantity of academic analysis that it warrants.

From a social, cultural and representational point of view, Google Earth is a very different object to the spatially unified, visually solidified, indexical photography that preceded it. Immediate differences between whole earth photography and the digital globe are obvious: the first is a representation of the actual earth, frozen in time from the instant that it was taken, the second is a dynamic, interactive model, around which is draped a mosaic/patchwork of constantly changing, digitally captured satellite images. Beyond these immediate differences, however, are sets of more subtle distinctions that, once we start looking, become almost overwhelming in their quantity. Perhaps the most significant and overarching distinction lies in its function as a program: subject to the laws and principles of the coded cultural form.

[3]Robert Poole argues this most forcefully, saying that the origins of James Lovelock's Gaia Theory can be approached through the viewfinder of the Apollo missions 'Blue Marble' photographs and quoting Lovelock himself who as stated that, "When I first saw Gaia in my mind I felt as must as astronaut have done as he stood on the Moon, gazing at our home, the Earth."

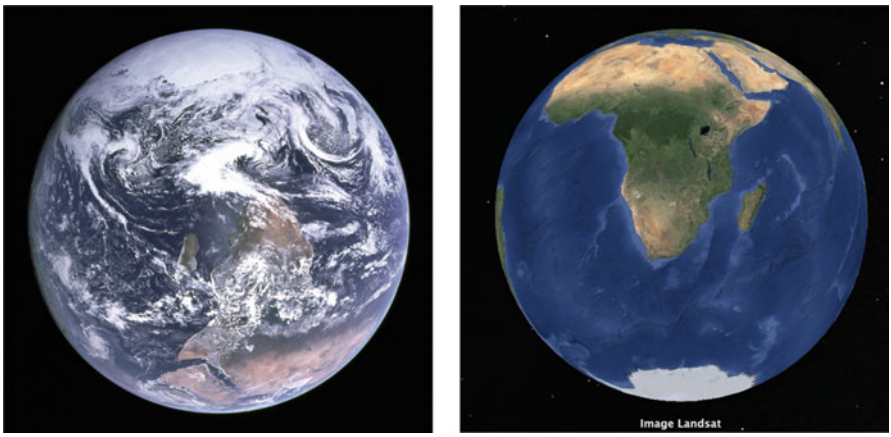

Fig. 11.1 *Left*: NASA's 'AS17-148-22727' photograph later renamed 'The Blue Marble'. *Right*: A screenshot of Google Earth 7.1.2.2041, Build date 2013

Where, for instance, the Blue Marble image presented an ecologically interrelated biosphere, unconstrained by anthropogenic factors such as political borders, Google Earth's start-up skin strips the earth of its cloud and weather systems, reinstating the primacy of the nation state in bright yellow lines, operating as a polar opposite to its predecessors with their one world message. Rather than presenting a fragile, interconnected ecosystem under threat from twentieth century industrial civilisation, Google Earth offers a profoundly twenty first century alternative. The Google Earth viewer does not see one interconnected ecosystem from afar, they drill down through a plurality of programmed 'ecosystems' to reveal layers of information, simulation and scale that constitutes a new environmental conception (Fig. 11.1).

In this chapter I will consider two interrelated areas of analysis most in need of immediate consideration following the transition to a composite digital globe as a primary reference point for the earth. In the first area I will ask, what is the digital globe? More specifically, what is Google Earth, how did it come into being, why is it the predominant representation of our world, and will it continue to be so? The second area of analysis concerns the changes that have taken place in environmental representation in recent years with the advent of the digital globe. Chiefly, what are the current and future implications of the digital globe and how does this feed into education and mediation of the environment?

All of these questions are ultimately interrelated to a broader assertion that I will make here, as I have made elsewhere: that the replacement of the whole earth genre of photography with digital earth programs marks a profound shift in the way that we are able to envision the environment, not only because the latter is an interactive form of digital media, but because it is also a cultural form governed by the twenty first century logic of the industrially engineered, computational new media object. From this, it is a short leap to go from beholding an industrially engineered and endlessly reprogrammable representation of the earth object to regarding the earth

itself as an industrially engineerable object in its own right. Before we address this claim in full however, we must first return to our initial question. What is the digital globe and how does it differ from previous whole earth representations?

What Is the Digital Globe?

The first point to make when considering the notion of the digital globe is that while it is undoubtedly a new media form, as a remediated digital object it is reminiscent of many of the media forms that preceded it: it is cartographic, it is topographic, it is photographic, it is panoptical, it is a data-visualisation, it is mathematical, it is algorithmic, it is representational. The important difference between it and previous forms lies in the fact that it can be all of these things at the same time. As an amalgam of the analogue forms that it succeeded (whole earth photographs, physical globes, cartographic data-sets) the digital globe brings with it many of the social, cultural, political, economic and scientific characteristics found in its predecessors. Indeed, this fact is one of the factors that presents scholarship of the digital globe with its first challenge: when it comes to the digital globe the potential avenues of study are literally vast. One is faced with the wealth of scholarship already conducted in cartographic construction (Hale 2007; Woodward 2007), cartographic technology (Brotton 1999), cartographic sociology (Morse 2007) philosophy and cartography (Watts 2007), politics and cartography (Kagan and Schmidt 2007) globes and model-making (Dekker 2007) and more from prehistory to the present. To say that all of this requires a nuanced understanding of the differences between the respective analogue forms that fed into the digital globe is an understatement.

Perhaps a better route to take, then, is one that seeks out those aspects of the digital globe that are specifically unique in the contemporary context. A good start here is, as Elle Dekker has already argued in quite a different context, to recognise the distinctive differences between notions of "the globe" from those of "cartography". As Dekker asserts, 3D globes were differentiated from 2D cartography at their inception during the renaissance by the fact that they stood for more than the three dimensional materialisation of cartographic knowledge. Understanding globes, she argues, requires that they be "considered as (mechanical) representations that facilitate a spatial understanding of things, concepts, conditions, processes, or events in the human world" (Dekker 2007: 136). What is true of the development of the physical globe during the renaissance is doubly so for the digital globe in the contemporary context. At the 6th International Symposium on the Digital Earth in Beijing in 2009, the declaration was made that the:

> Digital Earth is an integral part of other advanced technologies including: earth observation, geo-information systems, global positioning systems, communication networks, sensor webs, electromagnetic identifiers, virtual reality, grid computation, etc. It is seen as a global strategic contributor to scientific and technological developments, and will be a catalyst in finding solutions to international scientific and societal issues. (2009 Beijing Declaration on Digital Earth)

Among the "societal issues" (reminiscent of Dekker's description of the "things, concepts, conditions, processes, or events in the human world" of the fifteenth century and likely similar in nature) the symposium identified, "natural resource depletion, food and water insecurity, energy shortages, environmental degradation, natural disasters response, population explosion, and, in particular, global climate change."

Intriguingly, Dekker argues early globes can be regarded in many ways as some of the first computers, claiming that, in their capacity to allow users to work out the relationship between local times at different places, early renaissance globes "served as an analogue computer" (Dekker 2007: 150). In this sense, the digital globe can be seen as a geo-political tool many hundreds of years in the making. The most important facet of Dekker's claim is that it highlights a relationship between the representation of the earth as an object and notions of nature as mechanically predictable. Through the mechanical representation of daylight hours, seasons and time zones, the earth and the natural world were integrally linked from the earliest stages of the production of globes. It also tellingly demonstrates that notions of the globe as mathematically computational, underpinned the cultural logic of these objects from early in their history: a feature only accelerated in our contemporary context as digital globes become subject to the laws of the computationally coded computer program.

Where the digital globe differs from Dekker's analogue predecessors is the scale and scope. In the Beijing Declaration we have many concepts in play simultaneously: the coincidence of modern communications networks with software and computer visualisation; earth systems surveillance, monitoring, relay and rendering as data; cartography, weather systems eco-systems constructed, as both architectural and computational forms to name a few. What unites these multiple inputs and consequent outcomes of the earth represented as a digital globe is that of industrialisation: the industrial collection of data, the industrial scale of the data collected, the computer automated and therefore industrialised representation of such data, the industrial programmes required to build and launch surveillance and data gathering satellites and to keep them in orbit.

This brings us to the first central point about modern digital globes like Google Earth; that they are fundamentally industrial objects. At a visual level this goes beyond the mechanically reproduced "photography" of the whole earth genre and permeates the structure of the digital globe as a computer generated, mathematically specific model facilitated by the automated rendering of three-dimensional space.

Beyond the purely visual however, the digital globe also now represents the visualisation of a far wider industrial project to *gather and represent data about the world*. In other words, Google Earth is an exercise in industrial data-visualisation. Such an understanding of the digital earth should not be seen as necessarily precluding it from also functioning as an ecological object. On the contrary, we could argue that it is precisely because it is an industrial object that it is also an ecological one. Google Earth is a panoptical project that combines military industrial data-gathering technology at the same time as it represents a profound new example of the cultural production of "ecology". In a typically prescient observation

from 1972, Marshal McLuhan observed the intimate relationship between the military industrial capacities of satellite technology, emergent information based ecology and the earth as a mediated "artefact":

> Perhaps the largest conceivable revolution in information occurred on October 17, 1957, when Sputnik created a new environment for the planet. For the first time the natural world was completely enclosed in a man-made container. At the moment that the earth went inside this new artefact, Nature ended and Ecology was born. "Ecological" thinking became inevitable as soon as the planet moved up into the status of a work of art. (McLuhan 1962: 49)

McLuhan's description here highlighted the relationship between panoptical observation of the earth and an acute associated awareness of its status as an ecological entity described in the opening of this chapter. But McLuhan also drew a fascinating parallel between the "information revolution" inherent in the whole earth monitoring project and the idea that in doing so the earth itself became an ecological "artefact" – an idea we shall return to in the following section when we have considered the process by which Google Earth came into being.

How Did Google Earth Come Into Being?

Claims as to the origins of Google Earth as both an idea and as a program are frequently made and contradicted. Like many media forms, the idea of a fully simulated digital earth preceded by quite sometime the reality of its existence. We can see precursors to Google Earth in both the educational video *Powers of Ten*, made by Ray and Charles Eames in 1977 and in the "earth" programme featured in the 1992 novel, *Snow Crash*, by Neil Stephenson. Indeed, it has been claimed by technicians (Mark Aubin and John Hanke) originally working on the prototype to Google Earth that both of these references were influences,[4] but besides disagreements as to which was more significant, the fact is somewhat moot. More relevant is the wider developmental and political circumstances surrounding Google Earth's rise to prominence and what this tells us about the mediation of our environment through this program.

Google Earth was not just a panoptical project in the loose metaphorical sense of the term; it was literally panoptical in its origins within the defence and surveillance establishment. Originally called Keyhole (hence the computer coding acronym "KML" which stands for "keyhole mark-up language" still used by developers creating new "skins" for Google Earth), Google Earth originated as a spin-off project from a games company in 2001 and funded by In-Q-Tel (the tech project funding arm of the CIA) aiming to envision the earth as a dynamic model. The United States defence establishment had also deployed a spy satellite system in 1976 named Keyhole. In 2004 Google bought Keyhole and renamed it Google

[4]See paticularly: http://mattiehead.wordpress.com/2008/11/24/google-earth-inspiration-from-space-to-your-face/

Earth. Importantly, and as Michael Goodchild argues, Google Earth proved to be immediately popular because it adhered to the "child of ten" rule; that it was easy enough for a child of ten to use. In the GIS (Geographic Information Systems) community this is said to have been a disappointment for those who hoped for a more scientifically accurate, specialist piece of software. As Goodchild argues however, "the dominant paradigm of Google Earth remains visualisation – the manipulation of a virtual body whose appearance matches that of a real Earth as closely as possible" (2008: 36). Here, then, visualisation and ease of use are the driving forces rather than scientific accuracy or professional specificity. Central to this paradigm, is the fact that Google Earth operates as a platform applicable to the widest range of potential users and therefore potential media. Small wonder that the program has been so quickly adopted by news media around the world to provide immediate spatial content for breaking stories.

It is interesting that, in common with the Eames educational film, Google Earth should premise its development philosophy upon the concept of the "child of ten". All the more so when we consider that in 1998, foreseeing the moment at which the transition to a digitally remediated form of whole earth representation was likely drawing near, Al Gore started to aggressively rally support for the project to create a digital earth. In a much-commented on speech (Foresman 2008; Shupeng and Gendren 2008; Guo et al. 2010; De Longueville et al. 2010) Al Gore outlined his vision for a future digital earth. While he described it in terms similar to those of the Beijing declaration,[5] he also outlined a vision for its future that is particularly telling in retrospect and worth quoting at length:

> Imagine, for example, a young child going to a Digital Earth exhibit at a local museum. After donning a head-mounted display, she sees Earth as it appears from space. Using a data glove, she zooms in, using higher and higher levels of resolution, to see continents, then regions, countries, cities, and finally individual houses, trees, and other natural and man-made objects. Having found an area of the planet she is interested in exploring, she takes the equivalent of a "magic carpet ride" through a 3-D visualization of the terrain. Of course, terrain is only one of the many kinds of data with which she can interact . . . she is able to request information on land cover, distribution of plant and animal species, real-time weather, roads, political boundaries, and population. She can also visualize the environmental information that she and other students all over the world have collected as part of the GLOBE project. (Gore 1998)

Clearly then, Gore had more than a simple classroom tool in mind here. Given his subsequent foray into the climate change debate in *An Inconvenient Truth*, it seems apparent that Gore envisioned a tool that could not only educate children but also help shape and enhance their sense of connection to the earth's environment. Like many past discourses surrounding educational technology, the digital globe here was being envisaged as a partial answer to current social, political, cultural and ecological ills through the "education" of a future generation. Perhaps most

[5] As a means of aggregating multiple sources and forms of geo-located information and data, or as he summarised it, a "multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data".

notable about Gore's vision of a digital earth is that it was particularly global in outlook and civic in nature. Careful not to assert that such a project should be the exclusive domain of a single public enterprise or a single private company, Gore argued "obviously, no one organization in government, industry or academia could undertake such a project. Like the World Wide Web, it would require the grassroots efforts of hundreds of thousands of individuals, companies, university researchers, and government organizations" (Gore 1998). In the event, one organization (and a private one at that) did undertake such a project. As Lisa Parks has noted of Google Earth in another context:

> Google Earth transforms the sovereign territories of all of the world's nation-states into visual, digital, navigable and privatized domains (largely) owned by one US corporation, Google . . . Google claims copyright ownership of all of these frames unless they contain images originally classified as public domain. (NASA satellite images, for instance, remain public domain when they are part of Google Earth's databases.) In Google Earth the satellite image may be obscured or undated, but the Google brand is never lost. (Parks 2009: 541–542)

With this in mind it is particularly revealing to consider what happened to Al Gore's vision and ask why it was overtaken by Google Earth. Not least, such an analysis tells us a great deal about the current course and politics of environmental mediation.

In 2000 the incoming Bush administration is said[6] to have seen the digital earth moniker as a "political liability" and dropped Gore's vision in favour of a private, corporate delivery of a digital globe. Thus, with the Bush administration, the digital globe was dropped as a phrase and a concept. Ironically, however, its use continued in the wider scientific and academic community and was given formal state support in China where the International Society for Digital Earth was founded in 2006. On first site the Bush administration's rejection of the digital earth on the grounds of its association with the previous Democratic administrations Vice President looks like a geo-political error; especially given the fact that it provided the means by which China could step in to support the project. However, such an analysis fails to account for the fact that the digital earth that subsequently emerged in the US was far more in line with the neo-conservative preference for market led, corporately owned cultural, technological and economic innovation. As a corporate and privately owned media form, Google Earth may not have represented a publicly driven civic project (as NASA's digital earth – the World Wind program – would have) but it did reinforce the free market capitalist ideology of the neo-conservatives. The significance of this distinction could not be more profound for the way in which the environment and the simulation of the environment is mediated in the digital realm. This is not because it results in a different or edited account of the changes taking place and subsequently visualised, but because it is symptomatic of broader features that characterise the current approach to the environment in the world's most industrialised country.

[6]For specific detail on this point see the website of the 5th International Symposium of the Digital Earth available at: http://www.isde5.org/history.htm

Google Earth and Environmental Representation

Citing David Harvey's description of neoliberalism in her analysis of the "Crisis in Darfur" layer available on Google Earth, Lisa Parks points out that the intellectual property previously classified as public domain undergoes an ambiguous transition in status when accessed through the privatised interface of Google Earth. As she states, "public and private intellectual properties are intermixed within Google Earth so that their ownership status is unclear and becomes relatively indistinguishable" ((Parks 2009): 541–542). All of this is, she suggests, symptomatic of the neoliberal project to convert public property rights into privatised property rights. What Parks argues of the "Crisis in Darfur" layer in Google Earth is equally true of the data-collection and visualisation of the earth's environment in the program. Google Earth symptomatizes a wider privatised, neo-liberal and uncoordinated approach to the climatic changes taking place upon the earth. To paraphrase Parks, with Google Earth the digital corporation as opposed to the state, an international agency, or an NGO becomes the primary mechanism for distributing and visualising information about the environment.

More important than the public or private origin of the environmental data visualised in Google Earth's interface, then, is the fact that *it is presented as information now visualised by a private*, *corporate entity*. That is to say that Google's capacity as a private corporate entity to visualise the earth's past and future environments sends the message that such concerns are the natural domain of a market based cultural media form. When we consider that Microsoft owner, Bill Gates, is now one of the largest current contributors to geo-engineering research[7] (and a private individual at that) one might wonder if there is a correlation between the planet's climate, its mediation/remediation as a techno-economic IT industry project and the functional structure of neo-liberal capital. Indeed, at the opposite end of the ecological scale, Eugene Thacker has argued that a very similar correlation exists in the form of the global genome: a complex interrelation between biotech, infotech and corporate capital (Thacker 2005).

In a political environment in which governmental administrations do not maintain support for public calls to construct a digital globe, it should come as no surprise that they should also fall behind on the public coordination of, and debate over, geo-engineering to an extent that leads wealthy private individuals to conclude that they must step in to fill the gap. Of course it is more complex than this; the debate around geo-engineering research is fraught, to say the very least, with concerns that public and governmental agencies must take into account but which private individuals can more easily sidestep by operating outside the regulatory framework associated with public money. Nevertheless Google Earth has emerged as a cultural object subject to the development and ownership of a private corporation. If nothing else,

[7]See especially: http://www.guardian.co.uk/environment/2012/feb/06/bill-gates-climate-scientists-geoengineering

this is symptomatic of a context in which the planet's environment is symbolically mediated within the primacy of the neo-liberal market.

It would be problematically simplistic, however, to suggest that Google Earth as an interface, and as a machinic platform (Gurevitch 2013, 2014) functions solely according to the logic of a large global corporation. Indeed, the reception of Google Earth videos and Google Earth 'play tours' is an area deserving further research. The machinic nature of the Google Earth interface makes it a platform open to many uses and many readings by users across the world. The Google Corporation itself has set up a 'Google Earth outreach' arm with the stated aim of increasing access to, and diversifying use of, its programme. As Google's promotional/tutorial video (that has already passed two million views) on YouTube makes clear, its outreach programme is aimed at increasing non-profit making organisational access to the communicative capacities of its interface.[8] Beyond Google's own auspices, there have been numerous occasions in which the interface's potential to function to the detriment of neo-liberal structures of governance has gathered mainstream media interest. Military complaints that national security and military secrecy has been compromised (Scutro 2007) to broader governmental concerns that the programme could function to the advantage of terrorists planning attacks (Open Source Center 2008) suggest Google Earth is hardly monolithic in its capacity to structure the use and the readings of its interface.

To return to the individuated consumption of Google Earth however, there is another level of privatisation inherent in the interface that reconnects us to the distinction between the original whole earth photography genre and the specificity of the way in which contemporary digital earth software works. This distinction revolves around the centrality of the virtual camera in the digital earth interface. As Mike Jones (2007) has explained in his work on the virtual camera, its function marks a very different development of the concept of image capture from the camera forms that went before it and should not be confused as being a simulated equivalent of its physical predecessor. Without detailing the many productive distinctions that Jones lays out, it is worth noting first and foremost that the virtual camera is to some degree a by-product of games culture (another media form that powerfully connects visualisation and the child user). As such, objects do not exist in a physical or virtual reality before the virtual camera captures them (as with for instance the earth in the Blue Marble photograph of 1972), but instead are called into being as and when they are required. The socio-cultural and philosophical implications of this are considerable when dealing with the digital earth for a number of reasons.

Where the photograph of the earth was a cultural artefact subject to the logic of mechanical reproduction (Benjamin 2007) in which all consumers of the

[8]Though even here we are still returned to the neo-liberal context in which Google Earth has flourished: a tab in the outreach section marked 'grants' leads the user to a page that encourages organisations and individuals ('developers') to apply for grants for 'enterprise level products'. The question of Google's sovereignty over the allocation of this funding is entirely absent as are related questions: what kinds of 'organisations' qualify as worthy, which individuals will be deemed quality 'developer' material, or even what constitutes an 'enterprise level product'?

representation beheld the same image, the computer program works according to a very different logic. The virtual camera sets up a relationship between the viewer/user and an image form that is structured around the delivery of specifically requested, individuated, visualised information, which means that the "object" that comes into being for the user is precisely that; an object, manufactured in real time, solely for the purposes of the viewer's consumption and disposable at the point of satisfaction. What this means for users of the digital globe is that they are constructed by its interface as scopic gods, presiding over an earth object that can be visualised, viewed, reconfigured and disposed of at a whim. While the question of disposal should not be presented in too deterministic a light (a user is hardly likely to assume that disposal of a digital earth at the end of a session equates to the disposability of the earth itself), the question of human computer interaction is ripe for further analysis. To paraphrase Jones, with Google Earth the user of the digital globe has transitioned from a spectatorial position characterised by a shift from "eye to 'I'" (Jones 2007: 228). Furthermore, the user of the digital globe becomes accustomed, not only to a privatised interface (on multiple levels) but also to a representation of the earth as an engineered object fundamentally reconfigurable according to the logic of the computer program. Sea levels can rise, but they can also drop. Ice caps can melt but just as quickly grow. Everything is potentially subject to the logic of the undo button.

Whether geo-engineering has been researched and implemented or not, the philosophical process whereby the planet's environment is both simulated and gamed by users (whether they be adults or classroom children) is now being played out millions of times a day. What this means for the social and cultural acceptance of geo-engineering only time will tell (for more on this see Gurevitch 2013, 2014). It seems a supreme irony that whilst many in the environmental movement have argued for years that the combination of consumer capitalism and western individualism poses the greatest threat to the earth's long-term environmental future, such a future should now be represented via an interface so integrated with that philosophical reality. With this we are brought, by way of conclusion, to the future of environmental representation in the digital globe.

Future Eventualities of the Mediated Environment and the Digital Globe

When considering the future possibilities for the digital globe and their possible effects upon environmental representation, it seems unlikely that Google will retain its primacy indefinitely. There are many public offerings already in existence and there are many new digital globes coming online, supported by states (such as China and India) that have space programmes in their own right. How this plays out in the future could determine a great deal about the future of whole earth environmental representation. Similarly, whether states support new digital globes or not, it is inevitable that a programming task that was once technologically, economically and computationally expensive will become easier as time (and Moore's law of

exponential return) goes on. With this in mind we can, to continue a theme of the chapter, say that digital globes are currently in their infancy. Like all futurism, attempting to predict exactly where they will go from here would be both unwise and of questionable scholarly usefulness anyway. As we have seen throughout this chapter, however, it is not so much the digital globe itself that is of most significance so much as the way in which the earth's environment is visualised and represented. Rather, it is the competing cultural, political, economic agents that constitute the context in which the digital globe comes to function that in turn led to the visualisation of the environment. It is hard to know where the neo-liberal project of the past two decades will end up but if the past half decade have been anything to go by, it seems unlikely that it will continue to function according to "business as usual". Already GIS research scientists are envisaging futures for the digital globe in which ubiquitous computing allows for people to function as a crowd-sourced human centred "nervous system" observing and recording environmental changes to the earth in real-time (De Longueville et al. 2010). Such future visions open up the possibility that a future digital earth could be, as Al Gore optimistically envisioned in the mid 1990s, "a 'collaboratory' – a laboratory without walls for research scientists seeking to understand the complex interaction between humanity and our environment." (Gore 1998). Equally, however, such developments could simply mark the widening and deepening of the anthropocene; the contemporary era so named to describe the human induced changes being carved into the planet's geology. Whatever transpires for the future of the digital earth and the mediation of the planet's environment, it is clear that the interactions between data-collection, representation and reconstitution of the earth's ecology has changed indefinitely from the whole earth photographs that ushered in a generation of mediated ecological thinking. As McLuhan would have argued, our planet is increasingly an industrialised, informational artefact.

References

Benjamin, W. (2007). *Illuminations*. New York: Schocken Books.

Brotton, J. (1999). Terrestrial globalism: Mapping the globe in early modern Europe. In D. Cosgrove (Ed.), *Mapping* (pp. 71–89). London: Reaktion Books.

Cosgrove, D. (1994). Contested Visions: One-World, Whole-Earth, and the Apollo Space Photographs. *Annals of the Association of American Geographers*, 84(2), 270–294.

Castels, M. (2010). *The power of identity*. Chester: Blackwell.

Dekker, E. (2007). Globes in Renaissance Europe. In D. Woodward (Ed.), *The history of cartography* (Vol. 3, Part 1, pp. 135–159). London: University of Chicago Press.

De Longueville, B., Annoni, A., Schade, S., Ostlaender, N., & Whitmore, C. (2010). Digital Earth's nervous system for crisis events: Real-time Sensor web enablement of volunteered geographic information. *International Journal of Digital Earth, 3*(3), 242–259.

Foresman, T. W. (2008). Evolution and implementation of the Digital Earth vision technology and society. *International Journal of Digital Earth, 1*(1), 4–16.

Franklin, S., Lury, C., Stacey, J. (2000). Spheres of life. In *Global nature, global culture*. London: Sage.

Gore, Al. (1998). *The digital Earth: Understanding our planet in the 21st century*. http://www.isde5.org/al_gore_speech.htm. Accessed 1 July 2013.
Guo, H. D., Liu, Z., & Zhu, L. W. (2010). Digital Earth: Decadal experiences and some thoughts. *International Journal of Digital Earth, 3*(1), 31–42.
Gurevitch, L. (2013). The digital globe as climatic coming attractions: From theatrical release to theatre of war. *The Canadian Journal of Communication, 38*(3), 333–356.
Gurevitch, L. (2014). Google warming: Google Earth as eco-machinima. *Convergence Journal, 20*(1), 85–107. doi:10.1177/1354856513516266.
Hale, J. (2007). Warfare and cartography, ca 1450 to ca. 1640. In W. David (Ed.), *The history of cartography* (Vol. 3, Part 1., pp. 719–737). London: University of Chicago Press.
Haraway, D. (1997). *Modest witness: Feminism and technoscience*. London: Routledge.
Jones, M. (2007). Vanishing point: Spatial composition and the virtual camera. *Animation: An Interdisciplinary Journal*, *2*(3), 225–243. London: Sage.
Kagan, S., & Schmidt, B. (2007). Maps and the early modern state: Official cartography. In W. David (Ed.), *The history of cartography* (Vol. 3, Part 1). London: University of Chicago Press.
Lovelock, J. (1995). *The ages of Gaia: A biography of our living Earth*. London: Norton Books.
Lovelock, J. (2006). *The revenge of Gaia: Why the Earth is fighting back and how we can still save humanity*. London: Penguin.
McLuhan, M. (1962). *The Guttenberg galaxy: The making of typographic man*. Toronto: University of Toronto Press.
Morse, V. (2007). The role of maps in later medieval society: Twelfth to fourteen century. In W. David (Ed.), *The history of cartography* (Vol. 3, Part 1). London: University of Chicago Press.
Parks, L. (2009). Digging into Google Earth: An analysis of "Crisis in Darfur". *Geoforum, 40*, 535–545.
Poole, R. (2008). *Earthrise: How man first saw the Earth*. London: Yale University Press.
Redfern, M. (2003). *The Earth*. Oxford: Oxford University Press.
Roberts, M. (1998). Baraka: World cinema and the global culture industry. *Cinema Journal, 37*(3), 62–82.
Scutro, A. (2007). Satellite imagery raises security questions. *Navy Times*. Available at: http://www.navytimes.com/news/2007/08/navy_insecurity_070819w/. Accessed 1 Aug 2012.
Shupeng, C., & van Gendren, J. (2008). Digital Earth in support of global change research. *International Journal of Digital Earth, 1*(1), 43–65.
Thacker, E. (2005). The Global Genome: Biotechnology. London: MIT Press.
The Open Source Center. (2008). *The Google controversy—Two years later.* [Report]. URL: http://www.fas.org/irp/dni/osc/google.pdf [1st June 2013].
Watts, P. (2007). The European religious worldview and its influence on mapping. In W. David (Ed.), *The history of cartography* (Vol. 3, Part 1). London: University of Chicago Press.
White, F. (1998). *The overview effect: Space exploration and human evolution*. Virginia: The American Institute of Aeronautics and Astronautics.
Woodward, D. (2007). Cartography and the renaissance: Continuity and change. In W. David (Ed.), *The history of cartography* (Vol. 3, Part 1). London: University of Chicago Press.