Forget Psychogeography: The Object-Turn in Locative Media

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"The truth is rarely pure and never simple". Oscar Wilde, The Importance of Being Earnest

Abstract
Locative media offers to deliver information contextually, typically conceived in terms of geographic space. Locative practice had sought to playfully re-image the city. As the locative apparatus has become widespread, the novelty of this mannerist Situationism has diminished, yet it remains a useful concept for digital artists and designers to consider the prospect of every object on the planet as addressable and nature as a potential site for their compositions. Moreover, as the locative point of reference shifts from absolute (GPS) to more relational (RFID) notions of proximity, non-human things seem poised to reclaim their long forgotten status as governing assemblies.

IMAGE: Can You See Me Now

In 2003, *locative media* was initially proposed to name the emerging trend for GPS-based mapping project in the media arts, [1] and subsequently promoted within the media arts community throughout 2004. [2] By 2010, William Gibson would write, in his novel "Zero History", that “[l]ocative art probably started in London, and there’s a lot of it”. [3] Indeed perhaps the canonical work of locative media from this formative period was Can You See Me Now by the London-based performance collective Blast Theory, which used GPS-enabled mobile devices to turn the city into a game board, and which in 2003 was awarded the prestigious Prix Ars Electronica Golden Nica for Interactive Art. In the atemporal present where William Gibson now chooses to sets his science fiction, the ubiquitous integration of location-awareness into mobile devices, has led to the concept of locative media gaining widespread currency beyond the media arts. [4]

~~IMAGE: AmsterdamREALTIME, 2002. Esther Polak, Jeroen Kee and Waag Society~~

Locative media has been defined as “communication functionally bound to a location” [5]. Technically this is achieved for instance, by geo-referencing data to maps, embedding radio frequency identification tags (RFID) in the environment, using simply cameras to read markers such as barcodes on manufactured objects. While the first locative practicioners had to build these technologies for themselves, today many of these capabilities are built into most smart devices. [6] We can use the concept of the black-box, which actor-network theory derived from cybernetics, for “things whose contents have become a matter of indifference" [7], to consider how the technical apparatus which early locative media practice literally had to assemble, have become stabilized in current devices to the extent of being a standard and even banal feature. Yet, while we tend to think of locative media from the perspective of humans, the flip-side of this same process involves objects communicating with us and with each another. Human computer interaction design has developed an extensive literature on how human actions are situated though the material environment. [8] Philosophers of science have speculated on how interactive media subtly effect the relationship of humans to the environment, structuring subjectivity as we relate through our interactive apparatuses. [9] As envisioned by science fiction, prototyped by media artists and made abundant by application developers, the locative apparatus can be thought of as the cognitive map for navigating the complex entanglements of the contemporary period. [10] In the context of the matters of environmental health and sustainability with which human computer interaction designers seem increasingly concerned, [11] this paper will look at Bruno Latour’s recent infatuation with design in order to consider a shift from critique to “composition”. [12]

IMAGE: Q15_2192-GPSter.jpg

While locative media was celebrated throughout 2004 as the “next big thing”, it also inspired critique within the media arts community for failing to address technologies of surveillance and control upon which the medium was based. [13] Locative media, we were told, was bound up in a “machine-aided process of disciplinary attentiveness”

the aesthetics which were to be found “everywhere”, or as another neologism from that time would put it *everyware*. [14] There is however a nostalgia, if not perhaps even a degree of insincerity about this type of criticism implying, as it does, the existence of some autonomous realm *outside*, (of capital, or techno-science, of unmediated reality), leading Jacques Rancière to claim that "the tradition of critical thinking has metamorphosed into a deliberation on mourning". [15] In particular he cites the effect of Situationism on art as a "fatal capture by discourse". [6a] Indeed, there has, in fact, been a fascination with Situationist approaches to mapping since locative media’s inception (in particular psychogeography, an emancipatory project of wandering the city, intended to counteract the perceived degradation of urban existence by the confluence of the mass media and advanced capitalism) [16] an association which was equally vigorously been deplored in critique. [17] This association which has often been repeated in both theory and practice [18], might more appropriately be referred as to “mannerist Situationism”: “exaggerated... but ultimately decadent, compromised and slightly nihilistic [although] in many ways, much more attractive.” [19]. While these mannerist Situationists continue to draw ire for the narrowness of their theoretical base, [20] to my mind, their novelty has been exhausted and utility superseded. In what follows then, my intention is to leave this particular debate behind by proposing the notion of “post-locative practice”. Beyond the urban tactics of the mannerist Situationists, *dérive* (tracing space) and *détournement* (annotating space), [21] these practices *détourne* the locative apparatus itself as the basis for a new kind of ecological politics. The purpose of this paper is not to refute locative media but rather to re-imagine its *prospects* [22]. While an art historical re-reading of locative media, for instance, might emphasize a continuity with the reoccupations of early ’70’s land art [23], my point of departure is markedly different. Informed rather by science studies debates, I will attempt to develop the theoretical base of locative media by examining related practices by media artists engaging in “citizen science”, industrial and human computer interaction design. Considered together, these project reveal how natural and manmade objects are “composed” of issues, around which publics form. [24] While they may, to varying degrees all be framed as critical engagements with the technology, they nevertheless seem unconcerned with art’s continued nostalgic mourning over the "the proclamation of the end of political utopias."

[25] Rather, like the characters in *The Importance of Being Earnest*, these post-locative practices dress themselves up in order to infiltrate and undermine a system from within. They present, for example, the possibility to connect a commodity with its means of production, thereby [inadvertently] addressing a metaphysical problem at the base of Marx's labour theory of value. [26]

Before turning our attention to these new "compositionist" practices, as Latour would have us call them, let us begin first with an event-scene in order to demonstrate the limits of some the old critical paradigm of Situationism. Hundreds of people gather in a department store, to contemplate a single item, vanishing minutes later, leaving onlookers and attendants baffled. [27] The coordination of this first "flash mobs" in 2003, in fact coincided precisely with the emergence of locative media within the media arts. Slavoj Žižek celebrates the flash mob as a "post-Left space... interrupting the smooth flow of our participation in the routines of daily life." [28] In the new spirit of capitalism, the recuperation of the Situationist celebration of revolutionary play is indeed everywhere, proposed as the basis for a wholesale re-imagining of reality, this time modeled on a videogame. [29] As Andrea Branzi, a figurehead of the 60's radical design movement has claimed, perhaps the cultural avant-garde of '68 did get their revolution after all. [30] But while this radical semiotic critique developed into a linguistic preoccupation within the American academy of '70's, [31] today it seems to be giving way to what Noortje Marres calls "the object-turn" in cultural analysis, as signified by the ascendancy of actor network theory. [32] While deconstructionists argued that there was *no outside the text,* these new materialists claim that there is simply *no outside.*

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In contemplating the role of criticism today, Bruno Latour argues "(t)he critic is not the one who debunks, but the one who assembles", someone who adds to rather than subtracts from the reality of matters-of-fact. [33] "[R]eality", for Latour, "grows to precisely the same extent as the work done to become sensitive to differences." [34] To be clear, his is not a theory of difference in the post-Marxist sense. Latour's project is focused on what draws and holds things together, rather than what separates and keeps them apart,

proposing the controversial objects which actor network theory has studied as basis for a new “object-oriented” theory of politics. In its political ambitions, this object-turn seeks to ground the non-foundational concerns of French post-structuralist philosophy in the pragma, or *thing* in its Greek etymology, of American philosophical pragmatism. In an important sense Latour's object-oriented politics, are capable of engaging in a productive dialogue with the concept of "design thinking", which seeks to design systems that influence people’s behaviour on a mass scale by inspiring them to embrace designed systems as shareholders. [35] While his work did necessarily conclude in the material interventions of design, Latour was nevertheless a pioneered for his application of anthropological methods towards the study of modern scientific, “fact producing”, institutions, through tracing contingent material practices therein. [36]

Latour's version of actor-network theory has been characterized as an "object-oriented philosophy" [37], a type of metaphysics based on the fundamental principle that the world is made up of objects which gain strength only through their alliances, which are linked through translation, and in which, in Latour’s words: "nothing is, by itself, either reducible or irreducible to anything else." [38] If we compare this type of thought with that, for example, of the Situationist Guy Debord, in whose critique “[a]ll that was once directly lived has become mere representation”, [39] the contrast could not be more stark. Not only is Latour’s thought unconcerned with what is or is not “real”, it sees mediation as a means by which to strengthen alliances. As such it is appropriate that actor-network theory is now considered a key concept in media studies. [40]

IMAGE: Toaster Project

Latour's object-oriented philosophy emerges from his studies of the role of tools and mediation in practice. [41] In this approach *the social* to again in Latour’s words "does not designate a thing among other things, like a black sheep among other white sheep, but a type of connection between things that are not themselves social." [42] These networks are however transient, relying on actors to repeat the performance of their relations in order to sustain them, thus emphasizing the role of practice. This is where actor-network theory makes its controversial claim that by mapping the relations between

things and ideas, our apparatuses can, in fact be interpreted as possessing a kind of agency. At the very least they can be considered as “speech prostheses”, in so far as they permit a “nonhumans to participate in the discussion of humans”, [43] a claim which will be tested below by the media arts and human computer interaction design projects that engage in citizen science, since as Latour, the political philosopher claims, "[h]alf of public life is found in laboratories". [44] As scientists intuitively understand, complex matter-of-fact can not be assembled without the chains of reference supplied by their instruments. [45] In recent years the scientific method of public experiment has become increasingly influential to media art practicioners who are themselves used to dealing with complex technical instruments. [46]

Latour borrows the notion of *das Ding* as "a gathering" from Heidegger tool analysis, and (somewhat scandalously) applies it to the objects of science and technology in terms matters-of-concern, rather then matters-of-fact, webs of associations that the philosopher of science traces, and which the interaction designer in turn represents. Indeed, Latour's work has increasingly turned towards the arts and design, such exemplified by the *Making Things Public* exhibition curated collaborating with Peter Weibel at the *ZKM Center for Art and Media* in Karlsruhe, which sought to develop a concept of “representation” that connects political, science and aesthetics [47]. Drawing from the same philosophical pragmatist source as contemporary design thinkers, Latour conceives this project in terms of experimentation and multiplicity. For Latour, concepts from “Nature” to “the public” do not exist a priori, rather they are actively produced in relation to objects, for which the challenge is to design them well: “[d]emocracy can only be conceived if it can freely transverse the now dismantled border between science and politics, in order to add a series of new voices to the discussion, voices that have been inaudible up to now... the voices of non-humans". [48] He quite literally envisions the “design of politics” in pragmatist terms of "collective experimentation", in which the media arts [49] could play an important role in how scientific matters-of-fact are rhetorically constructed so that they may be debated and decided upon for entry into the public sphere.

IMAGE: MILKProject installation at Making Things Public exhibition, ZKM, photo by X

If we think for instance, in terms of climate change, which countless many argue as *the* pressing geo-political issue at the dawn of the 21st C [50], Latour is interested in how we can design technology to integrate the natural world within the political sphere. To this end, he criticizes the "Green" ideology of mainstream ecology as using a romantic vision of nature apart from technology to, in fact, “abort politics”. [51] Latour speaks of today’s “necessity of redoing everything once again in a strange combination of conservation and innovation that is unprecedented in the short history of modernism". [52] While Marx assumed nature to be a the blank substrate with which man combines his labour to produce capital, some environmental scientists today speak of natural system in terms of capital [53]. Considering the prospect, for instance of runaway climate change, [54] eco-pragmatism thus considers our obligation to intervene in natural systems, thus Stewart Brand has updated the famous Whole Earth motto to read “We are as gods and HAVE to get good at it.” Greens tend to recoil at the mention at climate intervention, such as for instance delivering sulphuric acid to the stratosphere, as a modern engineering as opposed to traditional ecological paradigm [55]. The nation of Bolivia have drafted a new constitution that enshrines the rights of nature "to not be affected by mega-infrastructure and development projects that affect the balance of ecosystems and the local inhabitant communities". [56] However, in placing nature beyond humanity, where science and technology can only *discover* matters-of-facts as opposed to *composing* matters-of-concern, Latour would diagnose their constitution as thoroughly modern in spite of the pre-modern spiritual revival with which it is associated. [57] This romantic, dualistic construction of mother nature and indigenous culture fails, for instance, to acknowledge that anthropogenic climate intervention was in fact practiced by pre-Colombian indigenous people to a degree that archeologists are only just beginning to be understand. [58] Latour criticizes any theory which takes “nature” for granted as the backdrop upon which politics takes place. [59] There can be no settlements based on a notion of "common nature," in which the full range of ontological antagonisms are not acknowledged. [60] Eco-pragmatist design is becomes is engaged in a processes of “inquiry” into the “indeterminate situation”

(to use the philosophical pragmatist jargon) of the environment in which the locative apparatus serves as a kind of looking glass for exposing the controversies out of which nature is composed.

There exists a symmetry in how matters-of-concern become black boxed through which design can consider the problem of representation across a variety of scales of agency. To this end the locative apparatus serves as both a literal tool and a kind of metaphor for seeing things in terms of networks to help us unpack the black boxes of consumer products and thereby re-position our bodily relationship with the environment, the ultimate goal of which, being, the internalization of the locative metaphor. Locative should, thus, not be misinterpreted as an overly instrumental reference to some abstract system of geographic coordinates. As a linguistic concept it refers to a grammatical case corresponding to notions of proximity, not absolute location in the Cartesian sense. For its part, actor-network theorists does not especially privilege geography over other form of connection when assembling their objects, [61] rather it thinks in terms of strengths of connections, which from the point of view of design can be envisioned in terms of proximity. [62] If locative has, over the course of time, become [mis-]identified with its art historical origins in GPS-enabled tracking and tracing, then post-locative practice might emphasize a more relational concept of location, for an environment where everything is in-flux. We might consider the locative apparatus once again in terms of wayfinding, as positioning a “user”, as designers often refer to humans, but also an object, in proximate relation to the issues by which they are effected, in order to generate *affect*. This, perhaps rather ambitious, definition of locative would be capable of accommodating its traditional geographic concerns (the physical location of one’s body will always be relevant), but also, crucially, praxis ranging from experiments with the Internet of Things, to information visualizations functionally bound to *objects*.

While locative media practice has typically sought to re-imagine urban space from the point of view human subjectivity, elsewhere we have noted practices which go “beyond locative media” using the Internet of Things, to reveal manufactured objects as networks of relations [63].With the emergence of the Internet of Things comes speculation about non-human things acquiring the ability to comment on their own environment, thereby effecting human behavior and

gaining a degree of agency. An early and notable example from the field of media art, exhibited at ISEA 2006, is Beatriz da Costa's PigeonBlog project which equipped pigeons with GPS-enabled electronic air pollution sensors in order to remotely map the air quality of the city in real time to Google maps. [64]

While the concept of ubiquitous computing has been around since early ’90’s [65], the Internet of Things has been embraced by designers as an alternative to the more decentralized version of the former, conceived of in terms of object-oriented design [66]. Bruce Sterling for instance, envisions a future RFID and locative media being used to track objects in space and time (hence his neologism “spime”) in service of a broader patterns of sustainable manufacturing and consumption, envisions networked things taking action, for example putting themselves on Ebay if they have been neglected. [67] Observing the intermingling of RFID with real world “blogjects” already in mid-’00’s, Julian Bleecker stated unequivocally that "(t)hings that matter inflict the course of social debate and discussion, and cannot help inflicting local and global change". [68] By embedding them with sensors, networking them together and attaching metrics to non-humans that are human-readable through the locative apparatus, even the most hardcore realist is confronted with the idea of non-human agency.

IMAGE: Crow Box, Joshua Klein, 2008

"Really, if the lower orders don’t set us a good example, what on earth is the use of them?" Oscar Wilde, The Importance of Being Earnest

For Bleecker "the Pigeon that Blogs now attains first-class citizen status. Their importance quickly shifts from common nuisance and a disgusting menace, to a participant in life and death discussions about the state of the micro-local environment." [69]. The same might also be said about Joshua Klein's "Crow Box" that leverages the intelligence of crows in order to get them to collect litter. These projects extend locative media's engagement with urban space as a site of social contestation by literally giving voice to the environment, opening up human computer interaction design to consider how to design systems for the inclusion of many more potential actors.

Indeed, when we consider John Berger's claim that modernity begins when people no longer directly depend on animals and they become symbolic [70] we can appreciate how the object-turn in what I am calling post-locative practice is in keeping with Latour's claim that we have, in fact, *never been modern*. [71] We could thus periodize the moment of from locative to post-locative practice to 2005, two years following Blast Theory's award, the Prix Ars Electronica Golden Nica for Interactive Art was this time awarded to the "MILKproject", which visualized the path of Dutch cheese back to its origins from dairy cows in Latvia, and which Latour curated in the same year as part of his at his "Making Things Public" exhibition at the aforementioned Centre for Art and Media in Karlsruhe. [72] Conceived in the romantic tradition of landscape art, [73] MILKproject is nevertheless something of a riposte to the romantic idyll of nature, augmented as it has become though the locative apparatus. Here again, we can contrast Latour's thinking with that of the traditional greens as well as the Situationist tradition of semiotic critique, both of which reject mediation. For Latour however, "[t]he more instruments proliferate, the more the arrangements become artificial, the more capable we become of registering worlds." [74] The locative apparatus functions in a similar manner to the "mallette à odeurs" used by perfumer to sensitize their noses, in order to learn to be affected. This is not however a postmodern plea for greater multiplicity, rather, as we are discussing an aesthetic objects here, the crucial criteria for judgement , for their entry into what Latour rather amusingly referred to during the exhibition as the "parliament of things", is how well or how poorly they have been articulated. [75]

IMAGE Fish Communication

Recent locative debates have indeed begun to shift towards framing artists' engagement with the Internet of Things in terms of emergent political models of relations between humans and non-humans, where the artist's role is to give representational agency to things "that otherwise would not have a parliamentary representation." [76] In his discussion with Natalie Jeremijenko, Benjamin Bratton draws on Rancière's notion of "the distribution of the sensible" [77], to help unpack the potential for the post-locative practices to "become part of the way that the commons understands and narrates itself... a tool for a politics that doesn't yet exist." [78] Rancière claims a historical

constancy with respect to "the ways that figures of community are aesthetically designed", specifically "the level of the sensible delimitations of what is common to all community, the forms of its visibility and of its organization." [79]

Jeremijenko projects expand conceptions of the city as a platform for environmental politics. As opposed to being Situationist, her approach is rather prototypically Latourian, in so far as she is engaged in assembly as opposed to critique, in order to articulate a criticism of east she calls the “crisis of political agency”, whereby environmental activism tends to be conflated with capital. Jeremijenko runs a research lab, which she calls the Environmental Health clinic, that seeks to change the way we think about technology and nature. As she discusses with Bratton, one exemplary project, simply entitled “Fish Communication”, floated a small barge of buoys on the Hudson river equipped with underwater sensors and small light above that glowed every time a fish swam underneath. [80] The work thus made it possible to observe some parts of the environment that would otherwise be inaccessible, instigating the audience to feed the fish. With new innovations in powering RFID allowing for energy to be passively harvested from the FM radio, AM radio, and cell phone base station signals in the atmosphere, [81] we can imagine this type of communication being possible wherever these signals are present.

IMAGE One Tree

Another of Jeremijenko’s project, “One Trees: An Information Environment”, critiques the construction of nature as existing outside a network of relations by planting genetically identical trees in various socio-economically different neighbourhoods in order to question the logic of genetic determinism. [82] While the trees themselves featured no sensors or actuators at all, they effectively “visualized” the locative data of the contingent environment, thriving in rich areas while struggling in poor neighborhoods. Jeremijenko thus presents us with a *situated technology* vying for the “first-class citizen” status of which Bleecker spoke in relation to the Internet of Things and da Costa’s augmented pigeon, yet doing so without “technology”. Through these examples we can rethink *locative* less as technology than as metaphor referring to local matters-of-concerns. Post-locative

practices thus provide a means by which to examine how *habit* is shaped by the environment, and how it can be changed.

Rancière argues for a direct connection between politics and aesthetics in which artistic practices contest the normal distribution of the sensible, or forms of visibility, which define the stake of politics, namely who has a voice. Similarly to Latour, for Rancière the essence of politics comes from supplementing this distribution with actors that have no part in the perceptual coordinates of the community [83] --in marked contrast however, Rancière is concerned with dispossessed human voices rather than non-humans. In addition to Jeremijenko, da Costa has continued to produce work in a similar vein, for instance developing portable air quality measurement kits for publics to contest the official scientific evidence demonstrates. [84] As design interventions into the urban fabric, using mobile mapping technologies these so-called “citizen science” bear comparison to locative media. Seemingly unconcerned, however, with art’s nostalgic contemplation of its lost autonomy, these projects often present themselves as research into the field of human computer interaction design, [85] a field connecting design, behavioural and computer science, organized around improving “users” experiences of technology.

IMAGE: Trash | Track

As critiqued by Paul Dourish’s, a renowned figure in the field, human computer interaction design tends to take “the environment” and “the market” as natural facts, what he refers to as *environmentality*. As locative and post-locative practices concerned with issues of environmental sustainability migrate from the media art avant-garde to human computer interaction design, in order potentially to achieve greater impact, they will also have to contend with what Dourish considers to be the *anti-politics machine* of human computer interaction design --in reference to its commitments to conceptions of technological progress and determinism as well as its neoliberal conception of the individual “user” as the ultimate arbiter of social change. His proposed solution is to design a social network for the locative apparatus that would allow the green consumer to see an object in terms of matters-of-concern, manifesting communal forms of agency, with the ultimate goal of effecting change at the level of state

regulation: “the action you are about to take aligns you with X but against Y”. [86]

Following the actor network approach developed above, the first step toward what Dourish, like Latour, refers to as the “design of politics”, is tracing networks. As compared with the aforementioned media art projects that recast objects of natural science as speaking things, these following design project portray manufactured objects in terms of networks. One such project, from product design, is Christien Meindertsma's PIG 05049, which condenses all the products made from a single pig after being shipped throughout the world—from chewing gum to ammunition—into a single representation. Another, from product design, is Thomas Thwaites Toaster Project which documents the process he undertook in his attempt to make a toaster for scratch—including mining and smelting his own iron ore. In the field of graphic design, a number of projects have visualized the source and destination of commodities for instance mapping data syndicated from trash collection or local watershed organizations. [87] As the MILKproject did with interactive art these design projects go beyond the hype for visualization to represent things as actor networks, thereby opening the "black boxes" of consumer products for inspection by the end-user. The British popular science writer Matt Ridley has mocked this genre for what he perceives to be its Romantic stance against specialization and exchange. Ridley aligns himself politically here with the neoliberal economist Leonard Read, who, in “I, Pencil”, famously argued that since it was impossible to name all its antecedents that go into making a pencil and no single person therefore knew how to make one, the “invisible hand” should be left alone to do its work. [88] The traceability built into the new ecology of networked things, however, leads Bruce Sterling to claim that the invisible hand is starting to become visible. [89] In conversation with Sterling, Julian Bleecker has developed the notion of *design fiction* as a critique of the disciplinary constraints of industrial design as well as to contemplate the dialectical relationship between science fact and science fiction (whereby the former relies upon the latter to prepare the public for new technological innovation). [90] As opposed to Ridley’s reading we can consider these DIY traceability projects as offering freeze-frame glimpses into manufactured objects as a locus of conversation between objects,

humans, scientists and designers, preparing us for the deep epistemological impact of the locative apparatus.

IMAGE: PIG 05049, Christien Meindertsma, 2009

I would like now to complete my look at the design of politics and the shift from critique to composition, by turning finally to post-locative interaction design for so-called lifestyles of health and sustainability (LOHAS). In supply chain logistics traceability has been widely required by regulation, for instances in the global food industry due to issues concerning food safety. [91] These regulations, combined with perceived consumer demand and pressure by consumers groups, have brought about a widespread trend towards corporate social responsibility which has in turn encouraged manufacturers to analyze and redesign product life cycles. [92] Until recently, these innovations had taken place on the supply side, signified to consumers via a variety of labeling schemes. A proliferation of LOHAS schemes and branding strategies combine to form a kind of discourse that has been referred to as “supermarket pastoral”. [93] When, for instance, compared with the dramatic changes in consumption patterns in digital media, the market in durable goods has remained relatively unaffected by the disruptive forces of media in transition. Recent dot-com startups, however, have developed applications that dis-intermediate what today we might think of as one of the last true broadcast media, the department store. Connecting products to the Internet of Things, via product barcodes, one system allow for direct connections between producers and consumers in order to trace and map a product’s supply chain and carbon footprint, while another attempts to perform calculations on every single ingredient by consults tens of millions of evaluations with data categorized in terms of health, environment and society composing what they refer to as a product ontology. [94] Since the emergence of locative media, the notion of location-awareness has acquired an increasingly finer granularity from satellites, to cell phone towers, to WiFi triangulation to barcodes and RFID, all the while decentralizing and creating more alternatives. The space opened up by these latest barcode-based applications, potentially allow users to personalize their experience of consumption in relation to a single object, much in the way that locative media practices had sought to do with urban space via GPS. Where early locative media art envisioned the emergence of

alternative geographies [95], the current post-locative human computer design applications have the potential to bring the controversial objects studied by actor network into the super market. "Clean-up on aisle B."

The idea of information, as developed by cybernetics, upon which digital media are built, seems fundamentally at odds to an embodied conception of being. Locative media is conceptually valuable in so far as it bridges the digital with the analog, it seems to give information a body. New standardized communications protocols make it possible for every single object on the planet to be part of the Internet of Things. [96] Yet while an entire discipline, namely human geography, is premised on the distinction between abstract space and embodied place, from the perspective of code, locations is just another arbitrary value. Setting aside the vast environmental impacts of computing, if the goal of locative media is to bring context to information, there is no reason why it should remain wedded exclusively to location. Context in locative media has typically been defined in rather absolute terms as geographic location. But context is free, as Bruno Latour reminds us “context is what actors constantly do” [97], what is at issue is the position from which to measure. As location-awareness continues to develop and become standardized into what we have called the locative apparatus, what emerges is a much more relational notion of proximity to objects. In addition to physically locating us in relation to them, objects become positioned in relation to one another, and crucially, through information visualization they become represented as gatherings of issues, in relation which we can position ourselves. Through the careful work of representation every object could carry with it its own unique chains of reference, thereby revealing the substance of “the local” to be composed of an endless variations of scales.

From the parliament which Emmanuel-Joseph Sieyès envisioned extended across the whole of France, to Buckminster Fuller's dome over Manhattan, technocratic ideals have tended to envisioned political assemblies in which were told to leave our passions at the door of the dome. [98] For Latour, the challenge faced by design is thus how to build a parliament of nature composed from of these competing claims for which he states: “rhetoric is not enough and nor is eloquence; it requires the use of all the technologies—especially

information technology—and the possibility for the arts to re-present anew what are the common stakes." [99] While the practices, projects and applications considered above, engage politically with the environment as aesthetic objects their successes are to be judged in terms of how well or poorly they have composed the issues. [100] They represent a radically de-centered locative apparatus which in turn suggests new ways of seeing the environment that go beyond a strictly instrumental use of technology, learning to become affected.

End Notes and References

[1] The phenomenon gained widespread recognition when the crowd-sourced GPS-traced map of Amsterdam by Esther Polak and the Waag Society (http://realtime.waag.org/) was featured in Slashdot. Other key moments included the Cartographic Congress, which brought together collaborative mapping enthusiasts in London (http://www.metamute.org/en/The-Cartographic-Congress), and the first "locative workshop" took place in Karosta, Latvia (http://locative.x-i.net/).

[2] In 2004, panels discussions on the topic would take place at *Transmediale* in Berlin, *ISEA* in Helsinki, *Futuresonic* in Manchester, *Virtual Systems Multimedia* in Montreal as well as locative workshops in Iceland (coordinated by Pall Thayer), Norway (coordinated by Kristin Bergaust), France (coordinated by Ewen Chadronnet) and Finland (coordinated by Marko Peljan). See: Marc Tuters and Rasa Smita (Eds.): *Transcultural Mapping Reader*, (Riga: RIXC Centre for New Media Culture, 2004).

[3] William Gibson, Zero History, (New York: Putnam Adult, 2010), 55.

[4] Within academia, for instance, the term *locative media* is used as a keyword in journals including amongst others: *Theory Culture and Society*, *New Media & Society, Space and Culture, Convergence, Simulation & Gaming,* and *Urban Studies,*.

[5] A definition that has remained more or less stable since the topic was first created in 2005 (http://en.wikipedia.org/wiki/Locative_media). Also relatively unchanged is the claim that the term was coined by Karlis Kalnins, an improperly cited, though often repeated reference. A more accurate description of the origins of the term would cite, amongst others, the role of the RIXC Centre for New Media Culture in promoting the concept through the networking platforms which they had developed: See Marc Tuters "Locating Locative: The Genealogy of a Keyword" *Acoustic Space: Networks and Sustainability*, no. 10, co-published by RIXC and Art Research Lab / Liepaja University (forthcoming)

[6] Global Positioning System (GPS) chips have become commonplace in smart devices since the first iPhone. While the system was first developed in the early 1970's, it was not until 2000 that the US government repealed their policy of "selective availability" which had downgraded the quality of its signals for civilian-use, opening up the consumer market for location-based services, particularly for out-doors activities, hunting fishing and wayfinding. A playful uses of the technology was "geocaching", a treasure hunt for physical objects using GPS coordinates or "waypoints" (initially developed in 2001, the author's *GPSter* project, for which the term locative media was first coined, was a database of media files encodes to these waypoints). As GPS requires direct line of sigh visibility of the sky, it is not however ideal for urban space, thus smart phones use a combination of positioning technologies including WiFi triangulation (the *GPSter* project already developed this technique in 2003 as *Where-Fi*). Advances in machine-vision algorithms, combined with hi-resolution camera chips allow for location relative to objects, although RFID readers have yet to be built into smartphones. For more documentation of early research in locative media search the Internet Archive's Wayback Machine for *GPSter.net* 2001-2006

[7] Michel Callon and Bruno Latour, "Unscrewing the Big Leviathan: How Actors Macro-Structure Reality and How Sociologist Help Them To Do So" Karin Knorr-Cetina and Antonio Cicouvel (eds.) *Advances in Social Theory and Methodology: Towards an Integration of Micro and Macro-Sociology*. (Boston, MA: Routledge, 1981), 285.

[8] Lucy Suchman, *Plans and situated actions : The Problem of Human-Machine Communication*. (New York, NY: Cambridge University Press, 1987). Paul Dourish, *Where the Action Is: The Foundations of Embodied Interaction* (Cambridge, MA: The MIT Press, 2004). Victor Kaptelinin and Bonnie Nardi, *Acting with Technology: Activity Theory and Interaction Design*. (Cambridge: MIT Press, 2006)

[9] Building on Foucault's concept of the apparatus, the diagrammatic structure of knowledge/power, Andrew Barry refers to an interactive diagram, which structures out subjectivity. See: Andrew Barry, "On Interactivity", Political Machines: Governing a Technological Society (London: Continuum International Publishing Group - Athlone, 2001), 127-152. See also: Giorgio Agamben, "What is an Apparatus?" *What is an Apparatus? And Other Essays*. Stanford: Stanford University Press, 2009. N. Katherine Hayles, "RFID: Human Agency and Meaning in Information-Intensive Environments". *Theory, Culture & Society,* vol. 26 no. 2–3 (2009): 47–72. Michel Callon, "Economic Markets and the Rise of Interactive Agencements: From Prosthetic Agencies to Habilitated Agencies" in Trevor Pinch and Richard Swedberg (eds.) *Living in a Material World: Economic Sociology Meets Science and Technology Studies* (Cambridge, MA: The MIT Press, 2008), 29-56.

[10] In his critique of postmodern hyperspace, Fredric Jameson famously questioned the subject's ability position itself in relation to an externally mappable reality. In the postmodern historical period architecture was a privileged aesthetic form for its unmediated relationship to capital. Yet, our phenomenological experience, was one of "bewildering immersion", a "mutation in the object unaccompanied as yet by any equivalent mutation in the subject", making wayfinding a key problem. Fredric Jameson, Postmodernism, or, The Cultural Logic of Late Capitalism (New York, NY: Verso, 1991), 38-45.

[11] Paul Dourish, "HCI and Environmental Sustainability: The Politics of Design and the Design of Politics" *DIS 2010*, August 16-20, 2010, Aarhus Denmark.

[12] Bruno Latour, "From Realpolitik to Dingpolitik -- or How to Make Things Public", *Making Things Public: Atmospheres of Democracy* (Karlsruhe: ZKM, 2006). Bruno Latour, "A Cautious Prometheus? A Few Steps Toward a Philosophy of Design (with Special Attention to Peter Sloterdijk)," Keynote lecture at Networks of Design conference (meeting of the Design History Society Falmouth, Cornwall, 3rd September 2008). Bruno Latour, "An attempt at writing a 'Compositionist Manifesto'", *New Literary History* vol. 41 no. 3 (Summer 2010), 471-490.

[13] See: Marc Tuters and Kazys Varnelis, "Beyond locative media: Giving shape to the internet of things," Leonardo vol. 39 no. 4 (2006): 357-363.

[14] Jordan Crandall, *Operational Media*. (CTheory, 2005). Adam Greenfield, *Everyware: The Dawning Age of Ubiquitous Computing*, (New York, NY: New Riders Publishing, 2006).

[15] Jacques Rancière, The Politics of Aesthetics, (New York: Continuum, 2006), 10.

[16] Marc Tuters, "The locative commons: situating location-based media in urban public space" (Electronic Proceedings of the 2004 Futuresonic Conference, 2004).

[17] Brain Holmes, Drifting Through the Grid. (Springerin 3, 2004).

[18] Alison Sant, "Redefining the Basemap," *intelligent agent*, vol. 6 no. 2 (2006). Michele Chang, "Asphalt Games: Enacting Place Through Locative Media," *Leonardo Electronic Almanac*, vol. 14 no. 3 (2006). Adam Greenfield and Mark Shepard, *Architecture and Situated Technologies Pamphlet 1: Urban Computing and Its Discontents* (New York, NY: The Architectural League of New York, 2007). Teodor Mitew, "Repopulating the Map: Why Subjects and Things are Never Alone," *Fibreculture*, issue 13 (2008). Julian Bleecker and Nicolas Nova, *Situated Technologies Pamphlets 5: A synchronicity: design fictions for asynchronous urban computing*, (New York, NY: The Architectural League of New York, 2009). Mary Flanagan, "Locative Games," *Critical Play: Radical Game Design* (Cambridge: MITPress, 2009). Connor McGarrigle, "The construction

of locative situations: locative media and the Situationist International, recuperation or redux?," *Digital Creativity*, vol. 21 no. 1 (2009). Darren Wershler, "The Locative, the Ambient, and the Hallucinatory in the Internet of Things," *Design and Culture*, vol. 2 no. 2 (2010).

[19] Simon Critchley, “The Infinite Demand of Art”, *Art & Research: A Journal of Ideas*, Contexts and Methods, vol. 3 no. 2 (2006)

[20] Kazys Varnelis, “Against Situationism” http://varnelis.net/blog/against_situationism

[21] Marc Tuters and Kazys Varnelis, "Beyond locative media: Giving shape to the internet of things," Leonardo vol. 39 no. 4 (2006): 359.

[22] Bruno Latour makes the distinction between having a future “un futur” and having a prospect “un avenir”: "What makes the times we are living in so interesting… is that… just at the time when people despair at realizing that they might, in the end, have “no future”, we suddenly have many prospects." Bruno Latour, "An attempt at writing a 'Compositionist Manifesto'", *New Literary History* vol. 41 no. 3 (Summer 2010), 484.

[23] Julian Bleecker and Jeff Knowlton, "Locative Media: A Brief Bibliography And Taxonomy Of Gps-Enabled Locative Media", *Leonardo Electronic Almanac*, vol. 14 no. 3 (2006)

[24] Noortje Marres, “No issue, no public: democratic deficits after the displacement of politics”, PhD Dissertation, Faculty of Humanities, University of Amsterdam.

[25] Jacques Rancière, *The Politics of Aesthetics*, (New York, NY: Continuum, 2006), 9.

[26] Karl Marx, Capital: A Critique of Politial Economy, Volume One, Translated by Ben Fowkes (Harmondsworth, Penguin Books, 1982 [1976]), 125-137

[27] Clay Shirky, Here Comes Everybody: The Power of Organizing Without Organization (London: Penguin, 2008), 165

[28] Slavoj Žižek, *Living in End Times*, (London: Verso, 2010) 363

[29] Jane McGonigal, *Reality Is Broken: Why Games Make Us Better and How They Can Change the World* (London: Penguin, 2011). Consider also, game designer Jesse Schell's SALT lecture that went viral in 2010, in which he speculated on a near future based on ubiquitous tracking embedded in the environment, that reward players, for instance, when they recall ads placed in their dreams by corporations. Jesse Schell. "Visions of the Gamepocalypse", *Seminars on Long Term Thinking*, The Long Now Foundation. 2010. http://fora.tv/2010/07/27/Jesse_Schell_Visions_of_the_Gamepocalypse.

[30] Andrea Branzi, "Postface" *No Stop City: Archizoom Associati* (Paris: Hyx, 2006), 142.

[31] Francois Cusset, *French Thought: How Foucault, Derrida, Deleuze, & Co. Transformed the Intellectual Life of the United States* (Minneapolis, MI: University of Minnesota Press, 2008).

[32] Marres sees this as part of a larger project in the humanities to establish embodied practices as alternative sites for engagement. Noortje Marres, "Testing Powers of Engagement : Green Living Experiments, the Ontological Turn and the Undoability of Involvement", *European Journal of Social Theory* vol. 12 no. 117 (2009), 123. See also: Ignacio Farías, "Introduction: decentring the object of urban studies", Ignacio Farías and Thomas Bender (eds) *Urban Assemblages: How Actor-Network Theory Changes Urban Studies* (Abingdon: Routledge, 2010), 1-24.

[33] Bruno Latour, "Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern," *Critical Inquiry*, vol. 40 no. 4 (2004): 246.

[34] Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, MA: Harvard University Press, 2004), 85.

[35] An ascendant theory also within business management, design thinking signifies the integration of many of the approaches advocated in John Dewey's experiential theory of education, into the

innovation process. A canonical example by the design firm IDEO, studied a hospital as a network that was constantly being performed and maintained by series experts, as opposed to an a priori material object, as the basis for their design intervention. For pedagogical an example one might look to approach taught at Stanford's "D School", which emphasizes method over outcome in order "to solve big problems." (http://dschool.stanford.edu/). See also: Bruce Mau, Jennifer Leonard & Institute Without Boundaries, *Massive Change* (New York, NY: Phaidon Press, 2004). Warren Berger, *Glimmer: How Design Can Transform Your Life, and Maybe Even the World* (London: Penguin Press, 2009).

[36] Bruno Latour and Steve Woolgar, *Laboratory Life: The Social Construction of Scientific Facts* (Beverly Hills: Sage Publications, 1979)

[37] Graham Harman, *Prince of Networks: Bruno Latour and Metaphysics*. (Victoria: re.press, 2009).

[38] Bruno Latour, *The Pasteurization of France* (Cambridge,MA: Harvard University Press, 1993), 158.

[39] Guy Debord (Author), Donald Nicholson-Smith (Translator) *The Society of the Spectacle* (New York, NY: Zone, 1995 [1967]), 1.

[40] Nicolas Gane and David Beer, *New Media: The Key Concepts* (Oxford: Berg, 2008), 27-31.

[41] One of the great contribution of actor-network theory has been to reveal how the practice of scientists involves securing active involvement of social actors in process of domesticating their theories into matters-of-fact, an insight which can be traced back to their ethnographic studies of experimental science in 80's and 90's. In so doing scientist give us more than just new things, they contribute to reconfiguring of wider social-material relations through the practice of public experiment. Indeed as they have shown, modern experimental science has developed as genre of publicity since its inception. See: Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump* (Princeton, NJ: Princeton University Press, 1989)

[42] Bruno Latour, *Reassembling The Social: An Introduction to Actor Network Theory* (Oxford: Oxford University Press, 2005), 5.

[43] Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, MA: Harvard University Press, 2004), 67.

[44] Ibid., 69.

[45] Matters become more problematic, however, when they spill over from the labs into democratic society which is not well adapted to dealing with object that have no clear boundaries. Hence, the fiasco of Climate Gate, in which climatologists became the centre of controversy after thousands of their emails were stolen and sifted through for evidence that that their conclusions had been "constructed". As compared with the slow composition of scientific method, it takes relatively little effort to sew public doubt, as Oreskes and Conway demonstrate in their analysis of the "tobacco strategy" of corporate-funded government lobbyists. See: Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York, NY: Bloomsbury Press, 2010)

[46] Beatriz da Costa. "Reaching the Limit When Art Becomes Science", *Tactical BiopoliticsArt, Activism, and Technoscience*, (Boston, MA: MITPress, 2008)

[47] Bruno Latour, "From Realpolitik to Dingpolitik -- or How to Make Things Public", *Making Things Public: Atmospheres of Democracy* (Karlsruhe: ZKM, 2006), 6.

[48] Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, MA: Harvard University Press, 2004), 69.

[49] A number of locative-type projects were featured in the *Making Things Public* exhibition including Christian Nold's Crowd Compiler (http://www.softhook.com/crowd.htm), MapMover by a team from Carnegie Mellon (http://www.andrew.cmu.edu/user/cdisalvo/mapmover.html) and the MILKproject by Esther Polak in collaboration with Ieva Auzina and the RIXC - Riga Center for New Media Culture (http://milkproject.net/).

[50] Elizabeth Kolbert, *Field Notes from a Catastrophe: Man, Nature, and Climate Change* (New York, NY: Bloomsbury USA, 2006). Stewart Brand, *Whole Earth Discipline: An Ecopragmatist Manifesto* (New York, NY: Viking Adult, 2009). Bill McKibben, *Eaarth: Making a Life on a Tough New Planet* (New York, NY: Times Books, 2010)

[51] Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, MA: Harvard University Press, 2004), 19.

[52] Bruno Latour, "A Cautious Prometheus? A Few Steps Toward a Philosophy of Design (with Special Attention to Peter Sloterdijk)," Keynote lecture at Networks of Design conference (meeting of the Design History Society Falmouth, Cornwall, 3rd September 2008), 11.

[53] Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farberk, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton & Marjan van den Belt "The Value of the World's Ecosystem Services and Natural Capital," Nature vol. 387 (1997), 253–260. cited in Paul Hawken, Amory Lovins and Hunter Lovins, Natural Capitalism: Creating the Next Industrial Revolution (New York, NY: Back Bay Books, 2008 [1999]), 5. adjusted from 33 trillion in 1994. by comparison the NYTimes estimates the total government's bailout of the financial sector for the US alone at $9 trillion. "Adding Up the Government's Total Bailout Tab", The New York Times, February 4, 2009 http://www.nytimes.com/interactive/2009/02/04/business/20090205-bailout-totals-graphic.html. Sources: Treasury; Federal Reserve; Federal Deposit Insurance Corporation

[54] Gwynne Dyer, *Climate Wars: The Fight for Survival as the World Overheats*, (Toronto: Random House Canada, 2008).

[55] Vandana Shiva, Stolen harvest: the hijacking of the global food supply, (New York, NY: South End Press, 2000), 114.

[56] John Vidal, "Bolivia enshrines natural world's rights with equal status for Mother Earth", The Guardian, Sunday 10 April 2011

[57] Bruno Latour, We Have Never Been Modern, (Cambridge, MA: Harvard University Press, 1991) 13-48

[58] See: Stewart Brand, "Chapter 8: It's All Gardening" and "Chapter 9: Planet Craft" *Whole Earth Discipline: An Ecopragmatist Manifesto* (New York, NY: Viking Adult, 2009). 235-274

[59] The fact that December 2009 Copenhagen talks on climate change failed to achieve international consensus while bank bailouts were globally passed in spite of seeming ideological and political differences for Slavoj Žižek signifies that it is easier for us to imagine an environmental apocalypse than any real change in capitalist relations. (Žižek, 2010, 334) By contrast Latour's take on failure of Copenhagen stems from what he considers as the failure of the idea of a "Nature" itself. (Latour, 2010, 473)

[60] Anders Blok, "War of the Whales: Post-Sovereign Science and Agonistic Cosmopolitics in Japanese-Global Whaling Assemblages", *Science Technology Human Values* (published online 3 August 2010), 1-27.

[61] When Latour and Yaneva apply the actor network approach to the study of architecture, for instance, they consider buildings in terms of controversies unfolding over time which, and bringing together a variety of actors from architects to regulations to foam models. Bruno Latour and Albena Yaneva, "Give Me a Gun an I Will Make All Buildings Move", R. Geiser (ed.), *Explorations in Architecture: Teaching, Design, Research*, (Basel: Birkhauser, 2008), 80-89.

[62] See for instance the IssueCrawler maps of Govcom.org. Govcom.org Foundation Amsterdam http://www.govcom.org/

[63] See: Marc Tuters and Kazys Varnelis, "Beyond locative media: Giving shape to the internet of things," *Leonardo* vol. 39 no. 4 (2006): 357-363.

[64] PigeonBlog Project http://www.pigeonblog.mapyourcity.net/

[65] Mark Weiser, “The Computer for the 21st Century”, *Scientific American Special Issue on Communications, Computers, and Networks*, Summer 1991

[66] Philip van Allen et al., *The New Ecology of Things,* Media Design Program at Art Center College of Design, 2007.

[67] Bruce Sterling, *Shaping Things*. (Cambridge, MA: The MIT Press, 2005).

[68] Julian Bleecker, *Why Things Matter: A Manifesto for Networked Objects* (self-published, 2006), 9.

[69] Ibid., 5.

[70] John Berger, *Selected Essays of John Berger*, (New York, NY: Vintage, 2003).

[71] Bruno Latour, We Have Never Been Modern, (Cambridge, MA: Harvard University Press, 1991)

[72] The MILKProject by Esther Polak in collaboration with Ieva Auzina and the RIXC - Riga Center for New Media Culture. http://milkproject.net/

[73] Marc Tuters and Kazys Varnelis, "Beyond locative media: Giving shape to the internet of things," Leonardo vol. 39 no. 4 (2006), 362.

[74] Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, MA: Harvard University Press, 2004), 85.

[75] Bruno Latour, "How to Talk About the Body? the Normative Dimension of Science Studies", *Body Society* vol. 10 no. 205 (2004), 225, 214.

[76] Benjamin Bratton and Nalatie Jeremijenko, *Suspicious Images, Latent Interfaces* (New York, NY: The Architectural League of New York, 2008), 36. According to this description PETA (People for the Ethical Treatment of Animals) might be seen as kind of art movement, --thought I seriously doubt they would, themselves, agree.

The point, however, being that a great many activist political causes could already be seen as attempts at “parliamentary representation” of non-humans, the most literal example of which being the former.

[77] Jacques Rancière, *The Politics of Aesthetics*, (New York, NY: Continuum, 2006), 37.

[78] Benjamin Bratton and Nalatie Jeremijenko, *Suspicious Images, Latent Interfaces* (New York, NY: The Architectural League of New York, 2008), Ibid., 37.

[79] Jacques Rancière, *The Politics of Aesthetics*, (New York, NY: Continuum, 2006), 18.

[80] Natalie Jeremijenko, Fish Communication, http://www.nyu.edu/projects/xdesign/ooz/

[81] “Monitor: Power from thin air”, *The Economist, Technology Quarterly*, Jun 10th 2010, http://www.economist.com/node/16295708

[82] Natalie Jeremijenko, One Trees: An Information Environment, http://www.nyu.edu/projects/xdesign/onetrees/

[83] Jacques Rancière, *The Politics of Aesthetics*, (New York, NY: Continuum, 2006), 3.

[84] Preemptive Media Project http://www.pm-air.net/

[85] Wesley Willett, Paul Aoki, Neil Kumar, Sushmita Subramanian, and Allison Woodruff, "Common Sense Community: Scaffolding Mobile Sensing and Analysis for Novice Users", P. Floréen, A. Krüger, and M. Spasojevic (Eds.): *Pervasive 2010*, (Berlin, Heidelberg: Springer-Verlag, 2010). Carl DiSalvo, Phoebe Sengers, Hrönn Brynjarsdóttir, “Mapping the Landscape of Sustainable HCI”. *CHI 2010* (Atlanta, GA).

[86] Paul Dourish, "HCI and Environmental Sustainability: The Politics of Design and the Design of Politics" *DIS 2010*, August 16-20, 2010, Aarhus Denmark.

[87] Christien Meindertsma's PIG 05049 http://www.christienmeindertsma.com/index.php?/books/pig-05049/ Thomas Thwaites Toaster Project http://www.thomasthwaites.com/the-toaster-project/ Trash | Track. MIT Senseable Cites Lab, http://senseable.mit.edu/trashtrack/tt-in-seattle.php?id=6. Brit, Arlene, "Background Stories, Visual Storytelling Techniques for Communicating Sustainability", http://www.arlenebirt.com/

[88] Matt Ridley, *The Rational Optimist: How Prosperity Evolves* (New York, NY: Harper, 2010), 28. Leonard E. Read, *I, Pencil: My Family Tree as Told to Leonard E. Read* (New York, NY: Foundations for Economic Education, 2008 [1958]), 11.

[89] Bruce Sterling, *Shaping Things*. (Cambridge, MA: The MIT Press, 2005), 23.

[90] Julian Bleecker, *Design Fiction: A short essay on design, science, fact and fiction* (self published, 2009). www.nearfuturelaboratory.com/.../design-fiction-a-short-essay-on-design-science-fact-and-fiction/ Bleecker's work is indebted to the concept of *critical design* as developed by Dunne and Raby. Anthony Dunne, *Hertzian Tales: electronic products, aesthetic experience and critical design*, (London: Royal College of Art computer related design research studio, 1999)

[91] See: Christian Coff, David Barling, Michiel Korthals & Thorkild Nielsen (Eds.) Ethical Traceability and Communicating Food. *The International Library of Environmental, Agricultural and Food Ethics*, vol. 15 (Berlin, Heidelberg: Springer-Verlag, 2008)

[92] Daniel Goleman, *Ecological Intelligence: How Knowing the Hidden Impacts of What We Buy Can Change Everything* (New York, NY: Crown Business, 2009)

[93] Michael Pollan, The Omnivore's Dillema: A Natural History of Four Meals, (New York, NY: Penguin, 2006), 134-140.

[94] Sourcemap - Open Supply Chains & Carbon Footprint, http://www.sourcemap.org/. GoodGuide: Green, Healthy & Safe Product Ratings & Reviews. www.goodguide.com/

[95] Tuters, M. (2001) “Variation on a videogame or spatial graffiti; the socio-spatial and futurological implications of augmented reality and location awareness” *Virtual Systems and Multimedia*, *2001*. Proceedings. Seventh International Conference on, pp 517 - 526

[96] Bruno Latour, *Reassembling The Social: An Introduction to Actor Network Theory* (Oxford: Oxford University Press, 2005), 186.

[97] 80.000 trillion when you consider that the 10-digit Electronic Product Code that uniquely identifies each of these object can generate 296 different numbers. See: N. Katherine Hayles, "RFID: Human Agency and Meaning in Information-Intensive Environments". *Theory, Culture & Society,* vol. 26 no. 2–3 (2009): 51.

[98] Bruno Latour, "From Realpolitik to Dingpolitik -- or How to Make Things Public", *Making Things Public: Atmospheres of Democracy* (Karlsruhe: ZKM, 2006), 20.

[99] Bruno Latour "From Object to Things: How to Represent the Parliament of Nature?", The Art, Technology, and Culture Colloquium UC Berkeley Center For New Media (10/17/05), http://atc.berkeley.edu/bio/Bruno_Latour/ In drawing on the republican ideal of the collective, Latour has however been criticized for his reliance on models of "politics-made, as opposed to accounts of politics-in-the-making", as failing to acknowledge divergence between abstract theories of the common good and the contingent entities that science and technology introduce and the abstract. Noortje Marres, “No issue, no public: democratic deficits after the displacement of politics”, PhD Dissertation, Faculty of Humanities, University of Amsterdam, 99-109.

[100] Bruno Latour, "An attempt at writing a 'Compositionist Manifesto'", *New Literary History* vol. 41 no. 3 (Summer 2010), 471-490.