FCJ–168 Do objects dream of an internet of things?

Teodor Mitew
University of Wollongong

Abstract:

This paper develops the notion of heteroclite sociable objects in the context of the emerging internet of things, and examines their transformative effect for understandings of sociability and agency. The notion of sociable objects attempts to capture the heterogeneous identity-shift occurring when heretofore obscure and mute objects ranging from toasters to thermostats acquire the agencies to leave semantically distinct traces online, and detour their human interlocutors into an object-mediated entanglement. Using a toolkit drawn from actor network theory and object oriented ontology, the paper discusses several examples illustrating the case for new parameters of sociability, better suited to a materiality acquiring conversational and anticipatory agencies.

Heteroclite I: Hermes, a walking statue

In a fragment of a comedy by Plato Comicus, a statue of Hermes stumbles on-stage and must answer the skeptic's question: 'Who are you? Tell me at once. Why are you silent? Won't you speak?' To which the statue replies, 'I am Hermes, with a voice of Daedalus, made of wood, but I came here by walking on my own'. (Daston, 2004: 39)

I may speak with the voice of my maker, but I came here on my own. I may be enunciating the agency of another, but have agency of my own too. In the Greek view of being, possessing a spirit was synonymous with having a voice, and therefore entities that appeared to be superficially inanimate yet had a voice signaled a transgression of the rules of occupancy, a deviation from the parameters of being, a *heteroclite*. By virtue of having a voice semantically legible to human interlocutors, a heteroclite thus stumbles onto the ontological plane of the animate, with all the ensuing transgressive consequences. In explicating the notion of a heteroclite, Lorraine Daston attempts to build a projection escaping the bifurcated 'objective view' we usually occupy when talking of objects (2004, 2007). In her view, making material artefacts eloquent does not mean one has to automatically resort to cheap ventriloquism, or projections of intentionality inevitably paired with admonitions of anthropomorphism – there is another way, and it begins with a vocabulary actively escaping the subject-object bifurcation. [1]

Heteroclite II: Brad, an anxious toaster

Brad is a toaster connected to the internet, and to other toasters like him. He often exchanges information with his fellow toasters, with whom he tweets about the usage habits of their human hosts. He and his fellow toasters are not owned as other, simpler, toasters before them used to be. They are *hosted* by humans who have promised to use them. He loves being used, and is sensitive to learning that other toasters are used more often than him. When feeling underappreciated, Brad will draw attention to himself by playing pranks, throwing tantrums, and expressing his sadness loudly on Twitter. Eventually, Brad will become disillusioned and demand a move to another, more caring host. He will depart, leaving the smell of burned toast behind him. [2]

Brad the toaster is part of the *Addicted Products* project by Simone Rebaudengo and Haque Design Research. [3] Brad is also a heteroclite, but, unlike the statue of Hermes – his ancient predecessor – he demonstrates not only independent agency but also overt sociability (more on this below). In fact, Brad's capacity for sociability is relentless; yes, he speaks with the voice of his maker, but he can also initiate agency independently, *as well as* communicate with other things and his human interlocutors. What is more, the trajectory of that communication also involves haptic interaction, intimacy, and desire. Brad, and other heteroclite things like him, are the enunciators of a disturbingly animate and relentlessly sociable Internet of Things [IoT].

Dreaming the Internet of Things

In simple terms, the IoT stands for the connection of usually trivial material objects to the internet – ranging from tooth brushes, to shoes or umbrellas. [4] At the very least, this connectivity allows things to broadcast sensory data remotely, in the process augmenting material settings with ambient data capture and processing capabilities. Once connected, each thing acquires a network address making it uniquely identifiable. The object usually has some sort of layered sensing capacity allowing it to dynamically register changes to its environment and transmit that information over the internet. In most cases it is also able to store and process that information, as well as independently initiate action [an ability known as *actuation*]. Due to its constant connectivity the thing is remotely localisable within its environment, and it may be provided with a semantic interface legible to humans (Yan, Zhang, Yang, and Ning, 2008).

In the IoT jargon, every object equipped with the above capabilities is said to become context-aware, where context is understood as the triangle of location-identity-state (Abowd et al., 1999). Therefore, an IoT object has a unique identity and is capable of dynamically engaging with, and registering changes to, its location and state. Completing the picture, the context data produced in the process is by definition transmitted to and indexed in a remote database, from the perspective of which the contextual data *is* the object. The logical result is a seemingly animate materiality, populated by tangibly active heteroclite objects.

As a term, the *Internet of Things* originated in 1999, with the work of two Massachusetts Institute of Technology [MIT] research labs: the Auto-ID Center and the MIT Media Lab. Kevin Ashton and Neil Gershenfeld respectively argued for the enfolding of things into the internet in an active role – either in terms of making the world comprehensible for things, or adding things to the internet (Mattern & Florkemeier, 2010: 2). In this context, the IoT was seen as a paradigmatic shift from the internet of discrete desktop/ mobile computers, to a broadly defined ambient connectivity permeating trivial material artefacts, therefore granting them agency visible to humans (Sterling, 2005). [5]

Arguably, networked objects first entered the popular imagination with speculative notions of ubiquitous computing popularised by Mark Weiser in the late 1980s (1991). Weiser framed the future of computing as an argument for the disappearance of technology, a vision where the technical apparatus recedes into an invisible, always-already obfuscated material background of daily life. His was a world populated by doors opening only to

people meant to pass through them, lights which switch on when one enters, and shops which automatically deduct the bill from one's credit card. [6] Current IoT literature rarely if ever returns to these early imaginaries, most probably because their deterministic reductionism is contrasted with a trajectory of development pointing in a different direction, one where rather than disappearing, the networked technical apparatus takes on an ever-more transgressive and visible role. [7] There is a lot to be said about the reasons for this divergence, and the focus of this text lies elsewhere, but one could take as a good starting point Clifford Nass' fascinating work on the crucial role of the anthropomorphic impulse in human-computer interaction (2012).

The trajectory of overt visibility can be traced already in a 2005 report by the International Telecommunication Union [ITU], entitled *The Internet of Things*, in which it is argued that the thickening of connectivity in information networks presupposes the connecting, and therefore enfolding into the internet *in a visibly active role*, of a rapidly growing amount of everyday objects and devices (2005). As the ITU report argues, in the interest of seamless integration of objects into information networks and databanks, it is crucial to inscribe objects with a standardised set of markings that will both identify them and allow them to be *visibly* traced. That is, the identification of objects by a standardised networked semantics will allow their mundane circulations in time-space to become *visible to humans*.

The report proposes that this identification will be based on radio frequency identification [RFID] tags which, while passively or actively beaming a positioning signal in the radio spectrum, can be tracked, engaged, and re-combined from a distance. [8] Furthermore, according to the ITU, to increase functionality and control such a system should be able to detect transformations in the displacement of objects through in-scribing an additional layer of information on them, called by the report an 'embedded intelligence'. The obvious continuation of this argument is that once information networks enfold trivial material objects such as toasters and thermostats, giving them visibly agential roles, the internet stops being overtly populated predominantly by humans. If that sounds like a stretch, consider how many cars, flower pots, fridges, doors, and cats you could encounter and interact with online even ten years ago? [9]

The metamorphosis of the heretofore overtly 'humans only' internet into an IoT entails the emergence of hybrid socio-digital assemblages, with ambient connectivity 'gelling' the practices of humans and nonhumans into an augmented space populated by strangely heteroclite agencies. Arguably, this shift offers two sets of problems – from the perspective of human users it questions fundamental notions of sociability, privacy, and identity, while from the perspective of objects it calls for a yet-to-be developed taxonomy of sociable things (Kluitenberg, 2006: 8). [10] Fundamentally, this is the same problem expressed

through two differing projections, or ways of seeing: that of a human engaged by heteroclite, suddenly sociable things, and that of an empowered object, which 'speaks with the voice of its master, but came here on its own'.

What of the object? What of Brad the toaster, and his proclivity towards sharing emotional reactions? Modernity gives things voice in one of two ways: on the one hand as idols [*fetishes*], which are 'false witnesses' and mere attribute projections of human agency, and on the other as self-evidential sensory experiences [*facts*], which lead the mind to truth as it is, without the corruption of human interpretation. [12]

The notion of *sociable objects* attempts to capture the heteroclite identity-shift occurring when heretofore obscure and mute objects ranging from toasters to thermostats acquire the agencies to *spill* semantically distinct *traces* onto the material world, and detour their human interlocutors into an object-mediated entanglement. In this context, the notion of traces imbued with sociability is informed by the work of Michael Shanks, notably by his seminal arguments on subject-object symmetry developed during his decades-long practice in archaeology (1992, 1993). The key element in this understanding is an ontologically flat entanglement of human and non-human agencies, which is perceived in terms of its intensities and absences. [13] On a more popular level, David Rose's work on the crucial role of the aesthetic impulse of *enchantment* in apprehending sociable artefacts aims* *to capture the same ontological shift (2014).

The spill-over of connectivity and subsequent socialisation of objects portends a rearrangement of 'the rules of occupancy and patterns of mobility within the physical world' (Bleecker, 2006), because when objects are enrolled as explicit actors the depth of their material circulations become explicit too. An early conceptual example of this process was developed by Julian Bleecker in the form of the *blogject* (2006). A blogject is, according to Bleecker, a conceptualisation of an object that blogs information about itself and its surroundings. A blogject incorporates the tenets of the ITU report quoted above: it tracks its location in space-time, stores this information for later access, and actively participates in social discussions until now exclusively reserved to humans as speakers (Bleecker and Nova, 2006).

Putting aside connectivity, tracking, and storage, the most important aspect of this scenario is the capacity of objects for active engagement with their location. In the industry jargon this ability is that of an *actuator*. The 2006 ITU internet report describes this as follows: 'An actuator is the mechanism by which an agent acts upon an environment. The agent can be either an artificial intelligent agent or any other autonomous being' (2006: 11). Obviously,

this definition of agency dispenses with the intentionality, subjectivity, or thing-ness of an entity, and instead concentrates on the relational entanglements of entities with their locale. As I will demonstrate below, this definition is surprisingly close to the ontological projection deployed by Actor Network Theory (ANT) and Object Oriented Ontology (OOO). In the case of objects, these entanglements can be illustrated on several levels – all resulting with a visible change in the material setting involved.

For example, the *Pervasive Service Interaction Project* [PERCI] by NTT DoCoMo Euro-Labs facilitates object interaction with an environment through haptic contact with a tagged surface – humans tangle with objects through touching or pointing at them with their mobile phones. [14] PERCI uses near field communication [NFC] tags in combination with visual markers such as quick-response [QR] codes to facilitate the low-level haptic interaction. In this scenario objects serve as internet interfaces, opening up space to potentially ubiquitous information, and aligning themselves with the interactive features of mobile phones (Broll et al., 2009: 74). In effect, the artefacts resulting from inscribing objects with an interface, connectivity, and a low level processing power constitute a semantically rich overlay on the physical environment. [15]

The *Tales of Things* project is another example in this context. [16] It allows human users to download QR codes, attach them to any object, and annotate them with data in the form of text, video, or audio. The resulting data shadow, or tale of the thing, can be accessed by any human with a smartphone by simply pointing their camera at the QR code. A tale can be GPS inscribed, allowing objects to be geo-located, and commented upon by other humans therefore allowing an object to aggregate long conversations. The object tales on the website range from encounters with shoes, vases, and medieval castles to an exceedingly long list of mundane object trivia, all carrying semantic overlays of varying depth. Some objects tell a simple tale of their encounter with a human, while others carry the invocation of human memories of events, experiences and feelings.

What is particularly interesting in both these scenarios is that material artefacts acquire semantic depth, an information-rich overlay, which can then be tangled with by humans and other objects. The mass production of the infrastructure necessary for such an overlay arguably started in 2004 with the introduction of RFID – commonly referred to as *arphid* labels on US military supplies. [17] An emerging technology for embedding sensing capabilities in everyday objects, arphids are, according to Bruce Sterling, 'a set of relationships first and always, and an object now and then' (2005: 77). The data-rich semantic overlay hanging beyond physical reality results in a hybridisation of space, creating what is essentially an animate environment with sometimes disturbing effects on the agential powers of objects.

In his analysis of the integration of objects into information networks, Nigel Thrift has theorised the resulting information-rich yet strangely animate environment as a *metasystem* (2006: 191). When a thing is enfolded into a metasystem the network becomes part of that thing's extended existence, while this already augmented existence is being dynamically mapped by the metasystem in question. Metasystems gain depth through the stacking of object-surfaces – what Thrift calls 'gaining a capacity to morph over space and time' – and the morphing, or depth, allows metasystems to control the mobility and immutability of the circulating actors, and to trace 'what sort of space and what sort of time has been thus designed' (Latour, 1988: 25). Accordingly, this additional layer of meta-systemic data-retention and recombination creates an entirely new class of heteroclite objects.

Bruce Sterling famously theorised a conceptual prototype of this object trajectory as a *spime* – a *thing* enfolding *a space* and *a time* through data (2005). He argues that spimes actively enfold space and time because they have the capacity to carry around their entire existence as a semantic layer. A spime can record the entire chronology of its circulations through materiality with the multitude of implications it may have had for its surroundings; in effect it carries the logistical record of its existence and through that a discernible social identity. From an IoT perspective sociable objects function as dynamically updated databases existing in a wider network of relational agencies.

As information networks 'soak through physical geographic space' (Bleecker and Nova, 2006: 2), the objects until now rooted in this space in *visibly* fairly fixed and passive roles, gain new ways to produce not only their own spatial-temporal depth but augment ours as well. [18] The ability, for the first time in human experience, to inscribe, track and recombine mobile chunks of space-time relations 'as they wander through' (Morville, 2005) has profound influence on the way we project ourselves in the world. Crang and Graham suggest something similar, when they argue that 'the opacities of mobility and the hidden geographies of memory are now being rendered visible' (2007: 791). The resulting dynamic can be described as a de-centering of humans from the position of sole enunciators of agency, with serious implications for conceptualisations of sociability, agency, and identity. [19]

When mundane everyday objects, or their virtual equivalents, acquire actuator status, they become tangible social actors and, from the perspective of their information imprint, indistinguishable from humans. [20] However, while pervasive tracking, logging, and observation are necessary functions of this stratum, they have profoundly disturbing implications for notions of public and private space. Even more important is the effect of the IoT on notions of human subjectivity, so ingrained in our world-building projections. As

Katherine Hayles astutely argues -

> *While surveillance issues are primarily epistemological (who knows what about whom), the political stakes of an animate environment involve the changed perceptions of human subjectivity in relation to a world of objects that are no longer passive and inert. In this sense RFID is not confined only to epistemological concerns but extends to ontological issues as well. (2009: 48)*

The ontological problematic is underlined by the capacity of IoT embedded objects to completely dispense with humans as intermediaries – that is, when such objects are in each other's interaction range they are a priori expected to socialise with one another, exchanging data (Yan, et al., 2008: 287). To clarify, this is an environment where fridges, cars, coffee cups and, of course, toasters form a contextually rich conversation with no human interference or presence. The resulting object-object interaction is, if at all, registered by humans as inaccessible background resonance, effectuating an altogether alien extelligent environment mixing the semantic layers of human and machine memories – as in the recollection of what happened then and there (van Kranenburg, 2008: 16). This semantic mash-up has been theorised as 'semantic gadgets' capable of actuator status and able to form 'device coalitions' without human intervention (Vazquez and Lopez-de-Ipina, 2008). Since these object societies have sensory and computational abilities, they are able to share, augment and 'understand' all the context information they acquire. [21]

Recently, Sally Applin and Michael Fischer have argued that, when aggregated within a particular material setting, sociable objects form what is in effect an *anticipatory materiality* acting as a host to human interlocutors (2013). The material setting becomes anticipatory because of the implied sociability of its component objects, allowing them to not only exchange data about their human interlocutor, but also draw on remote data resources, and then actuate based on the parameters of that aggregate social memory. Put differently, while the IoT profoundly undermines human-centric notions of sociability, it also makes the semantics of circulating IoT entities readable for, and visible to, other entities – be they human or nonhuman. Projects such as *Thingful*, *Sense Mother*, and *Addicted Products* illustrate how making object-semantics explicit and mobile renders their human interlocutors differently, within a hitherto unknown heteroclite terrain.

Thingful is essentially a search engine for publicly available IoT data streams and is the brainchild of architect and interactive designer Usman Haque. [22] It searches through metadata generated by devices with various stages of IoT capabilities. If an object's data feed is made publicly available - for example the sensory readings of a thermostat in a

Sydney office - then Thingful indexes the data and structures it around location and a range of different categories such as energy, home, environment, flora and fauna, etc. The platform allows human developers to share the data streams from their object sensorium in a variety of ways, therefore opening the potential for data feed recombination and collaboration and the resultant remote interaction of objects. [23]
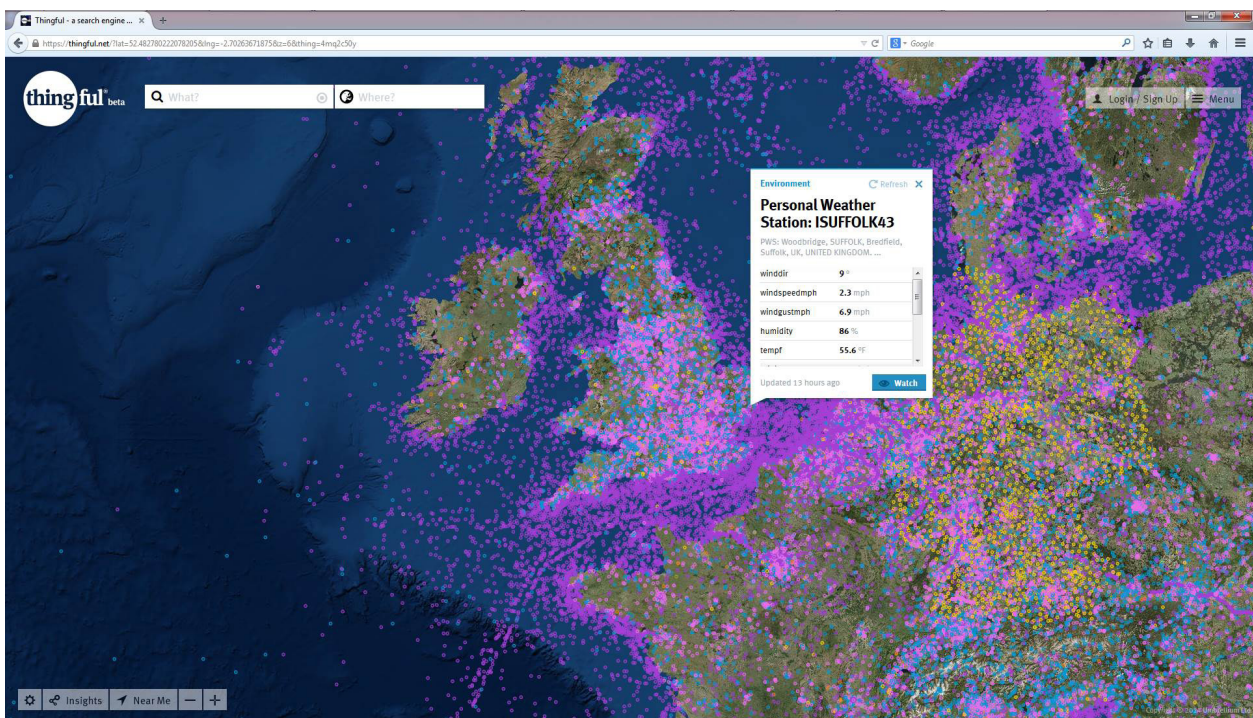

Figure 1: The Thingful search engine interface [screen capture from website]

Crucially, the operating presumption of Thingful is that the IoT entails exponentially higher levels of environmental monitoring and surveillance. Looking at a sample of data feeds – from measurements of radiation in Japan, to air quality, water, electrical, and even garden meters – it becomes easy to visualise a scenario when the majority of objects in a habitat stream recombinant contextual feeds to a Thingful-like platform, to be accessed by humans and other objects. Issues of privacy and surveillance, of 'who knows what about whom', become a constant negotiation, with the contextual sensorium of objects suddenly empowered to see, hear, record, transmit, and act.

The mode of continuous surveillance and anticipation involved entails a relentless self-disclosure from sociable objects, a disclosure which also includes translating into data the human interlocutors tangling with the objects. The *Sense Mother* system from Paris-based Sen.se – created by Rafi Haladjian - offers an insight into how this process looks in

practice. [24] The system is a small 'device coalition' consisting of a 'mother' unit, clearly inspired by the matryoshka doll aesthetic, and four 'motion cookie' sensors controlled by the mother. The mother acts as a central hub, and 'takes care of what matters most for you today', while the cookies are simply motion sensors that one can attach to any object or body. The sensors 'detect and understand the movements of objects and people' by transmitting the data to the mother unit which in turn contextualises it. The entire system is controlled through a series of apps for smartphone or tablet that, depending on what is being tracked, allow a user to track and regulate mundane acts such as sleeping, walking, teeth brushing, and taking your medication. One can also track contextual changes within a material setting – for example, the opening of doors, movement of various objects, changes in temperature, etc.
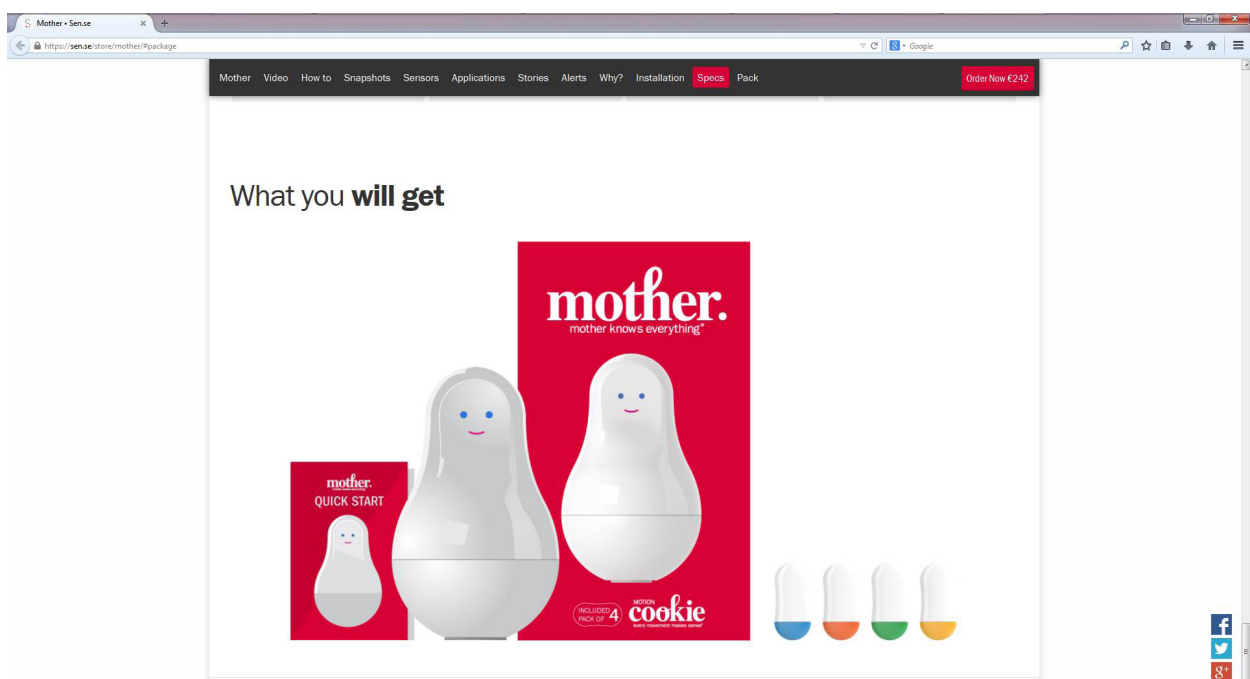

Figure 2: Sense Mother and her motion cookies
[screen capture from website]

The entire apparatus has the sleek interface packaging of a social media platform, where remote contextual changes in materiality are represented as elements of a dynamic news feed with which a human can engage. The implied reduction of the complexity of materiality and experience to measurable data-parameters is closely related to the aesthetics of the *quantified self* movement (Lupton, 2013). Crucially, the human interlocutors of Sense Mother are translated into yet another node in the IoT, exchanging the contextual data they invariably produce not only with other humans but also with sociable objects. This process reveals an important aspect of object sociability – from an object's perspective the human corporeal sensorium is always already mediated and augmented through algorithmic interfaces. The IoT human is always already a data-entity

interfacing with other such entities. Placed amongst socially-active data entities even the most minute and trivial of IoT objects can have a unique and semantically deep identity, accompanied by potentially inexhaustible memory – presumably located 'in the cloud' of a server farm. Already-sociable objects such as Sense Mother are able not only to aggregate human/machine memories, but also recombine them with other contextual data while engaging socially with their human 'friends', or hosts.

What all of these examples have in common is that objects enrolled in the network gain a surface which *makes visible to others* their sociability, while enrolling them in further networks of circulation. [25] The sociable object is therefore not simply a recording device for an expanding human subjectivity, but an active participant, a mediator co-constructing the newly defined social environment. In addition, due to its storage capacity such an object is among other things 'a device for the production and distribution of memories' (Barnet, 2005). The sociable object can *be* all these roles simultaneously because it is aware of its context – it has the ability to explicitly collect, discard, locate, measure, transmit, alter, and store information. [26] In other words, the sociable object is inextricably entangled in the semantic world of humans with all the implied ontological uncertainty as to the agential origins of entities.

Figure 3: Brad the Toaster in his material setting [screen capture from video]

As I will argue below in the context of ANT and OOO, it is from the perspective of this radically flat ontology that one has to approach heteroclites such as Brad the toaster, if we

are to make sense of the transition implied by the IoT. You, the human host, have to prove your affect towards Brad the toaster. His data sensorium registers your absence of affect, as expressed through the appropriate interface, and, more importantly, is able to socially contextualise that absence within the data stream of other IoT heteroclites. When social interactions ranging from haptics to verbal and visual are interfaced into a data stream, and that stream is then routed through an object equipped with sensors, actuators, and semantic layers for interfacing with humans and other objects, the result is a *persistently sociable object*.

Talking to Heteroclites

Here it is necessary to delineate the essential elements of actor network theory, the first of which is that it is not a theory at all (Latour, 1999). ANT is rather a way of seeing, an ontological projection capturing the multitude of human and nonhuman *entities* comprising a network. The second element, logically following from the first, is that ANT employs a semiotic definition of entity construction – the distinctions between entities are not hardwired into the world, but appear as an effect of the relations between them. Entities literally 'take their form and acquire their attributes as a result of their relations with other entities' (Law, 1999: 3). This means that all possible entity taxonomies appear a posteriori, as an effect of the networks of relations that have been traced. However, each entity is still a priori an actor capable of being *the initiator of* and *the conduit for* agency.

> An 'actor' in ANT is a semiotic definition - an actant -, that is, something that acts or to which activity is granted by others. It implies no special motivation of human individual actors, nor of humans in general. An actant can literally be anything provided it is granted to be the source of an action. (Latour, 1998)

I will return to the notion of the actant below, but for now it suffices to establish that the composition of each entity is a function of the dynamic and heterogeneous processes of its relational attachments, which ANT is preoccupied with tracing. To that extent ANT is a methodological framework for tracing entities as they perform themselves into existence, 'without imposing on them an a priori definition of their world-building capacities' (Latour, 1999: 20). For that projection to hold, ANT also makes an ontological claim on the flat, networked character of all actants. In practice this means that for ANT there is no ontological difference between the associations of elves, oxygen atoms, painters, fish, or accountants. Qualities such as strength or weakness are not a priori qualities of an entity,

but the result of its associations. The more allies it has translated and enrolled into an assemblage – the stronger an entity is (Latour, 1993).

There are two methodological principles deployed by ANT to move within this flat relational ontology. The first is known as the *principle of irreduction:* if all of chairs, philosophers, smartphones, labour unions, and elf kingdoms are entities acting on the same flat ontological footing, then we cannot reduce one entity to another – entities remain forever irreducible and never entirely explained by one another. The second is known as the *principle of translation*: if entities are irreducible, then their relations and the flow of agency between them have to be constantly performed and maintained. This is the *translational work* entities do to engage with one another. However, entities that are translated are irreducible to their translations. Put differently, the contextual data feed assembled by Sense Mother is a *translation* of the entities entangled within that network – yet they, whether human or nonhuman, are not reducible to the data extracted from them.

Figure 4: Brad the Toaster is moody [screen capture from video]

That being said, we are still left with the question whether there is a way of encountering relational entities, be they human bodies or machine artefacts, in their complex materiality. Object oriented ontology, whose main proponent, at least in the English-speaking world, is Graham Harman, has been largely preoccupied with exploring this question (2007, 2009, 2011). Drawing heavily on the projection and methodological toolkit developed by ANT,

OOO argues that if the principle of irreduction applies to all entities, then materiality cannot be fully reduced either to scientific fact or social relations. In the words of Ian Bogost, 'everything exists equally - plumbers, cotton, bonobos, DVD players, and sandstone' (2012: 6). Furthermore, having deployed the principle of irreduction, OOO also deploys the principle of translation, but then concludes that we have now rendered ourselves incapable of approaching the material in all its splendor. It is the muffled traces of material resonance, the 'black noise' of objects (Bogost, 2012: 33), left *after* translation that OOO is entirely preoccupied with apprehending.

To that extent, OOO deploys its own methodological maneuver — the speculative, or *anthropomorphic principle*. Bogost notes that 'anthropocentrism is unavoidable, at least for us humans' (2012: 65), and OOO views anthropomorphic metaphor as a way of tangling with materiality that does not translate or otherwise reduce it. In *Vibrant Matter*, Bennett has suggested that—

> *An anthropomorphic element in perception can uncover a whole world of reso-*
> *nances and resemblances - sounds and sights that echo and bounce far more*
> *than would be possible were the universe to have a hierarchical structure.*
> *(Bennett, 2010: 98–99)*

The anthropomorphic principle used in OOO and Bennett's work should not be confused with the simple anthropocentrism permeating modern projections of reality, and manifesting itself in the bifurcatory admonition encountered above. As understood by OOO, anthropomorphic metaphors are a way for humans to bridge the chasm between ourselves and objects. They create *affective resonance* between a human and a thing, thereby bringing us onto the same ontological plane. In this instance relation and translation take place as an anthropomorphic metaphor, a speculative analogy enabling humans to entangle what are otherwise profoundly alien artefacts. The main practical utility of ANT and OOO is precisely that they allow us to consider heteroclite artefacts, such as Brad the toaster, in the context of intensities of entanglement, of moody outbursts, and aesthetic resonance. The OOO maneuver of deploying anthropomorphic metaphor — one where Brad the toaster is moody and anxious from disuse, while Sense Mother is caring for what matters most — creates a resonance between otherwise profoundly distinct entities. Here again we can turn to Bennett's *Vibrant Matter*.

> *A touch of anthropomorphism, then, can catalyse a sensibility that finds a*
> *world filled not with ontologically distinct categories of beings [subjects and*

objects] but with variously composed materialities that form confederations. (Bennett, 2010: 99)

If, deploying the toolkit just assembled, we presume that distinctions between entities appear as an effect of the relations between them, the main strength of this conceptual apparatus lies in its capacity to encounter the heteroclite complexity of sociable objects without assigning to them a priori qualities in a hierarchy of being. In other words, the agencies we encounter will come prior to subject-object distinctions, and social relations will be relocated to a flat ontology constituted by the agential vectors of humans and heteroclites alike. The whole set of problems residual in the embattled notions of human subjectivity and identity is then sidetracked by a focus on relational agencies, neutral when it comes to human/nonhuman origins, yet capable of carrying an aesthetic sensibility expressed through the anthropomorphic principle. As Harman quips, 'atoms and quarks are real actors in the cosmos, but so are Fidel Castro, Houdini, and unicorns' (2007: 35). The canonical subject-object distinction of Western epistemology is not of much use in this projection, because it pre-orders the possible relations *before* we have even encountered them.
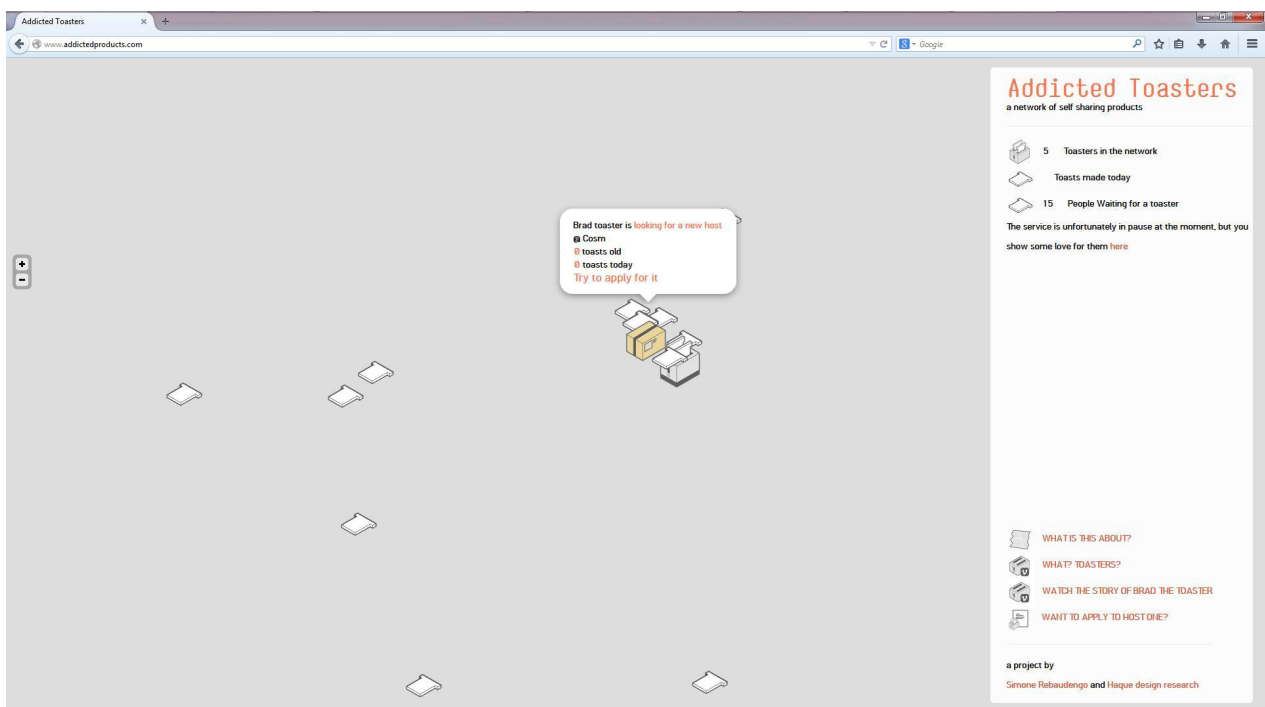

Figure 5: Brad the Toaster looking for a new host [screen capture from video]

An ANT/OOO toolkit therefore allows us to approach IoT infused material settings as fluid heterogeneous topoi, performed by the relational shifts of the entities comprising them. Both the IoT setting and the entities populating it are now visible in their agential complexity – all of Sense Mother, its motion cookies, and their contextual data feed, are now as visible and active *on the same ontological plain* as their human interlocutors. In fact, the ability to encounter heterogeneous topoi as well as the relational maneuvers necessary to perform entities 'into a very local, very practical, very tiny locus' (Latour, 1999: 17) is one of the most important attributes of the toolkit.

When deployed, the ANT/OOO toolkit allows encounter with the circulations of heterogeneous entities, and tangling with them as active participants in the material world *as well as* hosts for anthropomorphic affect. From the perspective of my argument, perhaps the most important contribution of ANT to the story of heteroclites such as Brad the toaster is precisely the notion of the active participant – the *actant* :

> *An actant is a list of answers to trials - a list which, once stabilized, is hooked to a name of a thing and to a substance. This substance is made the origin of actions. The longer the list of appearances the more active the actor is. The more variations that exist among the actors to which it is linked, the more polymorphous our actor is. The more it appears as being composed of different elements from version to version, the less stable its essence. Conversely, the shorter the list, the less important the actor. (Latour, 1991: 122)*

Even more specifically – an actor is whatever shifts the actions of *others*, where action stands for the list of performances through trials which provide an actor's trajectory (Akrich and Latour, 1992: 259). Notice how close the *actant* brings us to the notion of actuators - both notions concentrate on the 'answers to trials', on the entanglement of agencies as the new seat of identity. The ANT/OOO toolkit posits a continuous renegotiation of agential properties between humans and things, a collective '"object-institution" endlessly "brewing" hybrids' (Harris, 2005: 170). The notions of anthropomorphism and sociability are of crucial importance, as they allow us to include and grant a voice to nonhuman artefacts. [27]

Deploying the notion of the actant in relation to the Twitter feeds of a human and Brad the toaster, we are left with two lists and two answers to trials. In the comparison of these the human would not necessarily come out as the more socially important, or active, entity. Brad has an advantage, because as an IoT-based sociable object he is connected not only to his immediate surroundings, but also to a potentially enormous number of other heteroclites. When fully assembled, Brad's 'list of appearances' is perhaps longer, more intricate, and more intense, than that of many humans.

To reassess the argument, the boundary transgressions of heteroclite objects such as Brad the Toaster are a consequence of approaching IoT settings with metrics crude enough so as to obfuscate and purify their heterogeneity. The main value of the ANT/OOO projection is in that it allows us to capture the intensities of sociability of all kinds of entities, without reordering them a priori. Within that projection, the importance of the IoT as a phenomenon is that it renders potentially visible the list of traces generated by all kinds of entities – from the trivial to the enchanted. Further, the utility of the ANT/OOO toolkit is that it deploys a projection where any entity, human or nonhuman, is viewed as a sociable actant as long as it can present its list of answers to trials. Show me your list, please, and I will grant that you are a sociable entity. The more lists an entity appears on, the *more sociable* an actor it is, where the vector of sociability stands for the intensities, competences, entanglements, and affective encounters of the entity. [28] Armed with this sensibility we can approach the IoT with a projection rendering the semantics and circulations of suddenly sociable heteroclite objects *readable for* and *visible to* humans.

Biographical Note

Dr Teodor Mitew is currently with the School of the Arts, English and Media, University of Wollongong, where he teaches digital media and curates the digital media and communication major. His research focuses on the implications of the internet of things for sociability and memory. He also tangles with arduino boards and builds robots. He can be found on Twitter @tedmitew or at tedmitew.com.

Notes

[1] First, a note on language. As already suggested by the title, as well as in the spirit of existing work spanning actor-network theory and object oriented ontology – notably Adam Miller's brilliant *Speculative Grace* (2013), the vocabulary used in the text purposefully aims to transgress the revert-to-default impulse demanding overt intentionality or intelligence from material artefacts in order to permit emotions to be associated with them. In its overly simplistic form this impulse is usually framed as an admonition – you are anthropomorphising, and that is always a bad idea! After all, as Bruno Latour argued almost a quarter of a century ago, this all-too-common perspective must uphold the subject-object bifurcation of reality at all costs, while banning all notions of hybrid transgression, for what is at stake is the 'modern settlement' which it maintains (1993).

[2] http://vimeo.com/41363473

[3] http://www.addictedproducts.com/

[4] For simplicity I am using the terms *objects* and *things* interchangeably, even though their etymology suggest two conflicting approaches to materiality.

[5] Of course, one could choose to get bogged down in the semantics of defining 'objects' and 'connectivity', with the risk of extending the origins of the IoT to the early days of computing, the telegraph, the semaphore, or even – at a stretch – carrier pigeon networks. I am not aware of any IoT theorist, or industrial designer, taking that reductionist maneuver seriously.

[6] For a popular treatment of ubiquitous computing, see Greenfield (2006).

[7] For example, contrast the utopian reductionism of ubiquitous computing scenarios with Bruce Sterling's recent critical overview of the IoT state-of-play (2014). In addition, there is a rapidly expanding literature focusing on the paradigmatic shift entailed by the transgressive nature of IoT objects, in obvious contrast to earlier ubicomp imaginaries. For example, see Peter Morville's *Intertwingled* (2014), or more popular IoT treatments such as, among many others, those by Scoble and Israel (2014), or Kellmereit and Obodovski (2014).

[8] Passive RFID tags have a shorter range, are much cheaper to produce, and respond to a radio signal, while active tags emit a signal on their own and are more expensive. For an excellent overview of RFID's, see Hayles (2009).

[9] The list of IoT enabled material artefacts has been growing exponentially, and there is simply no space to give credit to their variety. The importance of objects having a voice as a vector of development is nicely demonstrated by this IoT enabled washing machine prototype by Berg - http://bergcloud.com/case-studies/cloudwash/. Specifically, notice the 'make it less chatty' menu option.

[10] I use the notions of sociability and the social in the context of the vocabulary used in actor-network theory and object oriented ontology. As I will elaborate below, here the social is understood to be always-already populated by both human and non-human entities. In this sense objects are understood as sociable when they visibly and actively entangle a human interlocutor into a negotiation. For an introductory treatment on the social understood in this context see Adam Miller's *Speculative Grace* (2013).

[11] Heidegger's research (1967) on the etymology of *thing* points at its roots in old Germanic languages, where it stood for an assembly, deliberation, or trial of opposing forces. See also the work of Pels, Hetherington, and Vandenberghe (2002). In this context, consider again the admonition against anthropomorphising – it is merely an overly

simplistic expression of the *fetish-fact* bifurcation.

[12] For an analysis of the complexities of newly informationalised environments, see Burrows and Ellison (2004), as well as Burrows and Gane (2006).

[13] A similar reading of the notion of traces appears in Timothy Morton's brilliant OOO treatise on object aesthetics (2013).

[14] http://old.hcilab.org/projects/perci/

[15] Kranz, Holleis, and Schmidt describe a similar scenario involving what they term as *netgets* – 'specialized networked gadgets with sensors and actuators that let users seamlessly manipulate digital information and data' (2010: 46).

[16] Tales of Things is part of a research project called TOTeM - a collaboration between Brunel University, Edinburgh College of Art, University College London, University of Dundee and the University of Salford. The project can be found at http://www.talesofthings.com/

[17] For an analysis of the cultural and social aspects of RFID tags, see Kluitenbrouwer (2006). Because of the primacy of the US military in developing the conceptual environment for RFID implementation, it is interesting to note that in their analysis arphids aim to provide 'identity dominance' on the battlefield through data saturation (McCue, 2005).

[18] On the potential agential power of things, see Beer (2007), as well as Dodge and Kitchin (2005, 2007).

[19] On the relation of IoT to notions of privacy and identity see Jedermann and Lang (2008), Crang and Graham (2007), Kluitenbrouwer (2006), Cubitt, Hassan, and Volkmer (2011), as well as Preuveneers and Berbers (2008).

[20] Dickerson et al outline the steps through which data streams online can acquire actuator status (2008: 360).

[21] Consider the already classic example of a socially active household device - the 'smart fridge' (Rothensee, 2008).

[22] https://thingful.net

[23] Thingful is the direct descendent of *Pachube* – an earlier prototype of IoT data infrastructure also created by Usman Haque. Pachube is now known as *Xively* [https://xively.com/], after it was bought by LogMeIn Inc.

[24] https://sen.se/store/mother/

[25] For example, Amin and Thrift make a convincing argument for a perspective on urban space as a hybrid (2002).

[26] A somewhat similar argument appears in Dana Cuff's concept of 'cyburgs' (2003), which stand for 'an environment saturated with computing capability' (2003: 44). According to Cuff, cyburgs produce an enacted space, relocating agency in the world.

[27] I think that both Illah Nourbakhsh's exhortation to 'stop dehumanising robots' (2013: 54–58), and Michel Serres' claim that 'humanity begins with things' (1995: 166) capture precisely this perspective.

[28] For an example of the practical value of Latour's concept of agency, in this case in archaeology, see Martin (2005).

References

Abowd, G. D., Dey, A. K., Brown, P. J., Davies, N., Smith, M., and Steggles, P. *Towards a better understanding of context and context-awareness* (Paper presented at the HUC '99: Proceedings of the 1st International Symposium on Handheld and Ubiquitous Computing, London , UK,1999).

Akrich, M., and Latour, B. 'A Summary of a Convenient Vocabulary for the Semiotics of Human and Nonhuman Assemblies', in W. E. Bijker and J. Law (eds.), *Shaping Technology / Building Society: Studies in Sociotechnical Change* (Cambridge, MA: The MIT Press, 1992), 259–264.

Amin, A., and Thrift, N. *Cities: Reimagining the Urban* (Cambridge: Polity Press, 2002).

Applin, S., and Fischer, M. *Thing Theory: Connecting Humans to Location-Aware Smart Environments,*(Paper presented at the Third International Workshop on Location Awareness for Mixed and Dual Reality LAMDa'13, Santa Monica, CA, USA, 2013).

Barnet, B. 'Infomobility and Technics: some travel notes', *CTHEORY* (2005), http://www.ctheory.net/articles.aspx?id=492 Beer, D. 'Thoughtful territories: imagining the thinking power of things and spaces', *City 11.2* (2007): 229–238.

Bennett, J. *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010).

Bleecker, J. 'Why Things Matter: A manifesto for networked objects - cohabiting with pigeons, arphids and aibos in the internet of things', (2006), http://nearfuturelaboratory.com/files/WhyThingsMatter.pdf

Bleecker, J., and Nova, N. 'Blogjects and the new ecology of things', (2006), http://blog.nearfuturelaboratory.com/2006/03/15/report-from-blogject-workshop-lift06/

Bogost, I. *Alien Phenomenology, or What It's Like to Be a Thing* (Minneapolis, MN: University of Minnesota Press, 2012).

Broll, G., Rukzio, E., Paolucci, M., Wagner, M., Schmidt, A., and Hußmann, H. 'Perci: Pervasive Service Interaction with the Internet of Things', *Internet Computing 13.6* (2009): 74–81.

Burrows, R., and Ellison, N. 'Sorting places out? Towards a social politics of neighbourhood informatization', *Information, Communication & Society 7.3* (2004): 321–336.

Burrows, R., and Gane, N. 'Geodemographics, software and class', *Sociology 40.5* (2006): 793–812.

Crang, M., and Graham, S. 'Sentient Cities: Ambient intelligence and the politics of urban space', *Information, Communication & Society 10.6* (2007): 789 - 817.

Cubitt, S., Hassan, R., and Volkmer, I. 'Does cloud computing have a silver lining?' *Media, Culture & Society 33.1* (2011): 149–158.

Cuff, D. 'Immanent Domain: Pervasive Computing and the Public Realm', *Journal of Architectural Education 57.1* (2003): 43–49.

Daston, L. *Things That Talk: object lessons from art and science* (New York: Zone Books, 2004).

Daston, L., and Galison, P. *Objectivity* (New York: Zone Books, 2007).

Dickerson, R., Lu, J., Lu, J., and Whitehouse, K. *Stream Feeds - An Abstraction for the World Wide Sensor Web,* (Paper presented at the First International Conference on the Internet of Things, Zürich, Switzerland, 2008).

Dodge, M., and Kitchin, R. 'Code and the transduction of space', *Annals of the Association of American Geographers 95.1* (2005): 162–180.

Dodge, M., and Kitchin, R. '"Outlines of a world coming into existence": pervasive computing and the ethics of forgetting', *Environment and Planning B: Planning and Design 34.3* (2007): 431–445.

Greenfield, A. *Everyware: The Dawning Age of Ubiquitous Computing* (Berkeley, CA: New Riders Press, 2006).

Harman, G. 'The importance of Bruno Latour for philosophy', *Cultural Studies Review 13.1* (2007): 31–49.

Harman, G. *Prince of networks: Bruno Latour and metaphysics* (Melbourne, Australia: re.press, 2009).

Harman, G. *The Quadruple Object* (Winchester, UK: Zero Books, 2011).

Harris, J. 'The ordering of things: Organization in Bruno Latour', *The Sociological Review*

53.1 (2005): 163–177.

Hayles, N. K. 'RFID: Human Agency and Meaning in Information-Intensive Environments', *Theory, Culture & Society 26.2–3* (2009): 47–72.

Heidegger, M. *What Is a Thing?,* trans. W. B. Barton Jr. and V. Deutsch (Chicago: Gateway Books, 1967).

ITU. 'The Internet of Things: ITU Internet Report', (2005), http://www.itu.int/osg/spu/publications/internetofthings/InternetofThings_summary.pdf

ITU. 'digital.life: ITU Internet Report', (2006), http://www.itu.int/osg/spu/publications/digital-ife/docs/digital-life-web.pdf

Jedermann, R., and Lang, W. 'The Benefits of Embedded Intelligence – Tasks and Applications for Ubiquitous Computing in Logistics', *Lecture Notes in Computer Science 4952* (2008): 105–122.

Kellmereit, D., and Obodovski, D. *The Silent Intelligence: the intenret of things* (San Fancisco, CA: DnD Ventures, 2014).

Kluitenberg, E. 'The network of waves: living and acting in a hybrid space', *Open 11* (2006): 6–17.
Kluitenbrouwer, K. 'RFID & agency: the cultural and social possibilities of RFID', *Open 11* (2006): 50–59.

Kranz, M., Holleis, P., and Schmidt, A. 'Embedded Interaction: Interacting with the Internet of Things', *IEEE Internet Computing 14.2* (2010): 46–53.

Latour, B. 'Opening one eye while closing the other: a note on some religious paintings', in G. Fyfe and J. Law (eds.) *Picturing Power: Visual Depiction and Social Relations (Sociological Review Monographs Vol. 35)* (London: Routledge, 1988), 15–38.

Latour, B. 'Technology is society made durable', in J. Law (ed.) *A Sociology of Monsters: Essays on Power, Technology and Domination (Sociological Review Monographs vol 38)* (London: Routledge, 1991), 103–131.

Latour, B. *We Have Never Been Modern,* trans. C. Porter (Cambridge, MA: Harvard University Press, 1993).

Latour, B. 'On Actor Network Theory: A few clarifications (part 1)', posting to nettime mailing list, 14 January (1998), http://www.nettime.org/Lists-Archives/nettime-I–9801/msg00019.html

Latour, B. 'On recalling ANT', in J. Law and J. Hassard (eds.) *Actor Network Theory and After* (Oxford: Blackwell Publishers, 1999), 15–25.

Law, J. 'After ANT: complexity, naming and topology', in J. Law and J. Hassard (eds.) *Actor Network Theory and After* (Oxford: Blackwell Publishers, 1999), 1–14.

Lupton, D. 'Understanding the human machine', *IEEE Technology and Society Magazine* (Winter, 2013): 25–30.

Martin, A. 'Agents in Inter-Action: Bruno Latour and Agency', *Journal of Archaeological Method and Theory 12.4* (2005): 283–311.

Mattern, F., and Florkemeier, C. 'From the Internet of Computers to the Internet of Things', *Informatik-Spektrum 33.2* (2010): 107–121.

McCue, C. 'Data mining and predictive analytics: battlespace awareness for the war on terror', *Defense Intelligence Journal 13.1–2* (2005): 47–63.

Miller, A. S. *Speculative Grace: Bruno Latour and Object-Oriented Theology* (New York, NY: Fordham University Press, 2013).

Morton, T. *Realist Magic: Objects, Ontology, Causality* (Ann Arbor, MI: Open Humanities Press, 2013).

Morville, P. 'Ubiquitous Findable Objects', posting to O'Reilly website, 17 November (2005) http://www.oreillynet.com/pub/a/network/2005/11/17/ubiquitous-findable-objects.html

Morville, P. *Intertwingled: information changes everything* (Ann Arbor, MI: Semantic Studios, 2014).

Nass, C., and Yen, C. *The man who lied to his laptop: what machines teach us about human relationships* (New York, NY: Current, 2012).

Nourbakhsh, I. R. *Robot Futures* (Cambridge, MA: The MIT Press, 2013).

Pels, D., Hetherington, K., and Vandenberghe, F. 'The Status of the Object: Performances, Mediations, and Techniques', *Theory, Culture & Society, 19.5/6* (2002): 1–21.

Preuveneers, D., and Berbers, Y. 'Internet of Things: A Context-Awareness Perspective', in L. Yan, Y. Zhang, L. T. Yang and H. Ning (eds.) *The Internet of Things: From RFID to the Next-Generation Pervasive Networked Systems* (New York: Auerbach Publications, 2008), 287–307.

Rose, D. *Enchanted Objects: Design, Human Desire, and the Internet of Things* (New York, NY: Scribner, 2014).

Rothensee, M. 'User Acceptance of the Intelligent Fridge: Empirical Results from a Simulation', *Lecture Notes in Computer Science 4952* (2008): 123–139.

Serres, M., and Latour, B. *Conversations on science, culture, and time,* trans. R. Lapidus (Ann Arbor: University of Michigan Press, 1995).

Scoble, R., and Israel, S. *Age of Context: mobile, sensors, data and the future of privacy* (San Francisco, CA: Patrick Brewster Press, 2014).

Shanks, M. *Experiencing the Past: on the character of archaeology* (London: Routledge, 1992).

Shanks, M., and Tilley, C. *Re-constructing Archaeology: Theory and Practice* (London: Routledge, 1993).

Sterling, B. *Shaping Things* (Cambridge, MA: MIT Press, 2005).

Sterling, B. *The Epic Struggle of the Internet of Things* (Moscow: Strelka Press, 2014).

Thrift, N.'Donna Haraway's Dreams', *Theory, Culture & Society, 23.7–8 * (2006): 189–195.

Van Kranenburg, R. *The Internet of Things: A critique of ambient technology and the all-seeing network of RFID* (Amsterdam: Insitute of Network Cultures, 2008).

Vazquez, J. I., and Lopez-de-Ipina, D. 'Social Devices: Autonomous Artifacts That Communicate on the Internet', *Lecture Notes in Computer Science 4952* (2008): 308–324.

Weiser, M. 'The Computer for the 21st Century', *Scientific American* 265.3 (1991): 66–75.

Yan, L., Zhang, Y., Yang, L. T., and Ning, H. *The Internet of Things: From RFID to the Next-Generation Pervasive Networked Systems* (New York: Auerbach Publications, 2008).

OPEN HUMANITIES PRESS

The Fibreculture Journal is published by The Fibreculture Journal Incorporated in partnership with Open Humanities Press.