Title:
A Manifesto for Networked Objects — Cohabiting with Pigeons, Arphids and Aibos in the Internet of Things

Short Title:
Why Things Matter

trackbacks:
Bruce Sterling. Shaping things. MIT Press, Cambridge, Mass., 2005.

Donna J. Haraway. The companion species manifesto: dogs, people, and significant otherness. Prickly Paradigm, University Presses Marketing, Chicago, Ill., 2003.

Bruno Latour. We have never been modern. Harvard University Press, Cambridge, Mass., 1993.

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Ever since this "blogjects" topic has started circulating, I've been asked lots of things, but two questions have come to the fore. First, why would objects want to just blog? Second, why would I care if objects "blog"?

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Abstract

The Internet of Things has evolved into a nascent conceptual framework for understanding how physical objects, once networked and imbued with informatic capabilities, will occupy space and occupy themselves in a world in which things were once quite passive. This paper describes the Internet of Things as more than a

world of RFID tags and networked sensors. Once "Things" are connected to the Internet, they can only but become enrolled as active, worldly participants by knitting together, facilitating and contributing to networks of social exchange and discourse, and rearranging the rules of occupancy and patterns of mobility within the physical world. "Things" *in* the *pervasive* Internet, will become first-class citizens with which we will interact and communicate. Things will have to be taken into account as they assume the role of socially relevant actors and strong-willed agents that create social capital and reconfigure the ways in which we live within and move about physical space.

Lantronix™ XPort™ device — about the size of your thumb — will put any object or thing that produces data, into the network.

To distinguish the instrumental character of "things" connected to the Internet from "things" participating within the Internet of social networks, I use the neologism "Blogject" — 'objects that blog.'

What's a Blogject? What about Spimes?

"Blogject" is a neologism that's meant to focus attention on the participation of "objects" and "things" in the sphere of networked social discourse variously called the blogosphere, or social web. The Blogject is a kind of early ancestor to the Spime, Bruce Sterling's resonant, single-syllable noun for things that are searchable, track their location, usage histories and discourse with the other things around them. Sterling is an articulate and thoughtful sci-fi design agent and he can come up with words like "Spime." I am an engineer and a researcher of near-future technocultures who also makes things and makes things up. I can grok "Spimey" things, and register Sterling's technology fiction. As an engineer, I can make Blog-

jects now because the semantics are immediately legible — objects, that blog. Tonight, I can go into my laboratory and begin to experiment with what a world might be like in which I co-occupy space with objects that blog. To make Spimey things — well, Sterling's technology fiction will have to explicate itself in the form of his forthcoming treatment, something I eagerly await. I read Sterling's Shaping Things as a field guide to the technology fiction I imagine he is presently writing about. Out of that reading came a tiny nugget of insight: if there's one thing Spimes will do, they will most certainly "blog."

Blogging? Objects?

The distinction between objects that blog, and human agents that blog is important to flesh out, starting with what bloggers are. "Bloggers" loosely defined, are participants in a network of exchange, disseminating thoughts, opinions, ideas — making culture — through this particular instrument of connections called the Internet. (Bloggers also do so when they meet face-to-face, but we'll avoid that important nuance for the time being.) Bloggers, as a type of social being, do more than literally blog. They report on what they see, know and think about. They may use "blog software" — a paleolithic mechanism for circulating culture — and lots of other things. Probably most importantly, they have something semantically weighty to talk about, whatever their particular idiom of social exchange may be — politics, geek news, gadgets, music, personality fetish, knitting, best practices for smoking salmon — what have you.

In the same way, Blogjects — objects that blog — don't just literally "blog" in the routine sense. Although there are good examples of some embryonic Blogjects that literally just blog (and don't even do a very good job — they're hardly two way, don't pay attention to comments — but I guess some human bloggers don't pay attention to comments, either), blogjects in the near-future will participate in the whole meaning-making apparatus that is now the social web, and that is be-

coming the "Internet of Things." The most peculiar characteristic of Blogjects is that they participate in the exchange of ideas. Blogjects don't just publish, they circulate conversations. Not with some sort of artificial intelligence engine or other speculative high-tech wizardry. Blogjects become first-class a-list producers of conversations in the same way that human bloggers do — by starting, maintaining and being critical attractors in conversations around topics that have relevance and meaning to others who have a stake in that discussion. If the contribution to that discussion happens through some seemingly mundane bit of networked disseminated insight matters little in terms of their consequence. A Blogject can start a conversation with something as simple as an aggregation of levels of pollutants in groundwater. If this conversation is maintained and made consequential through hourly RSS feeds and visualizations of that same routine data, this Blogject is going to get some trackback.

Blogjects are slowly creeping out of the primordial soup of passive, low-impact thing-ness. Blogjects aspire to relevance, and assert themselves because of new perspectives or additional insights they can offer on a semantically meaningful topics.

Take the Pigeon that Blogs, for example — an early protozoa on the the Blogject species evolutionary chain. The Pigeon that Blogs is a project by Beatriz da Costa. It's a pigeon, or more precisely, a flock of pigeons that are equipped with some telematics to communicate on the Internet wirelessly, a GPS device for tracing where its been flying, and an environmental sensor that records the levels of toxins and pollut-

ants in the air through which they fly. These are the bits of data that the flocks "blog." They disseminate their flight paths, probably viewable on a Google Map, together with information about the current toxic state of the local atmosphere. The Pigeon that Blogs is a mash-up of GPS, GSM communications technology and pollution sensors represents a full-order species evolution. It's a pigeon pollution Google Maps mash-up.

What does this all mean? Like all good "mash-ups" it means more than the sum of its parts. Whereas once the pigeon was an urban varmint whose value as a participant in the larger social collective was practically nil or worse, 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. Pigeons that tell us about the quality of the air we breath are the Web 2.0 progeny of the Canary in the Coal Mine.

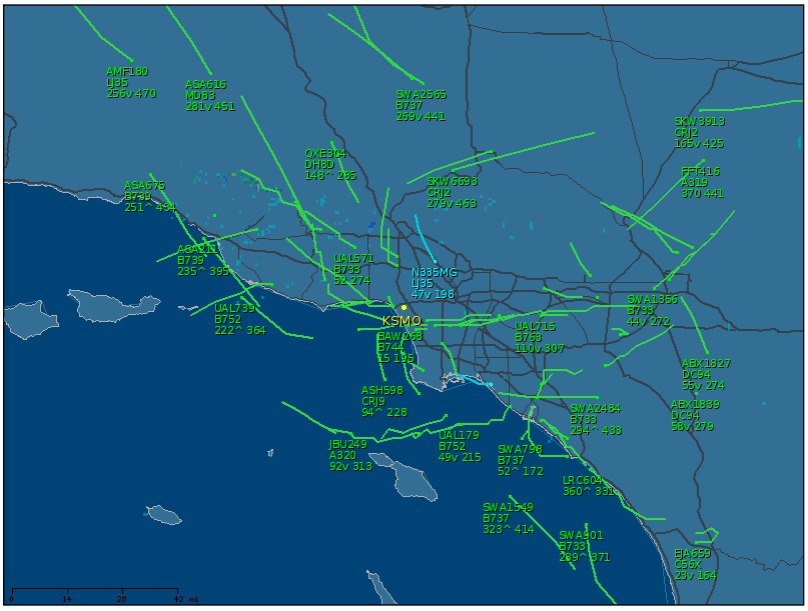
Blogjects: Some Characteristics

Blogjects have some rudimentary characteristics, very much part of the rules of behavior in a Spimey world. These are not definitive features, but rather elements, traits and idiosyncrasies that might be found amongst objects that participate in the social web. Here are three peculiarities of Blogjects:

- ✦ Blogjects track and trace where they are and where they've been;
- ✦ Blogjects have self-contained (embedded) histories of their encounters and experiences
- ✦ Blogjects always have some form of agency — they can foment action and participate; they have an assertive voice within the social web.

Traces — Blogjects Know Where They Are

Traces are about knowing where you are and where you've been in a geospatial sense. Blogjects operate in the physical world and, therefore, would know where they are, where they have been. Blogjects would know what other Blogjects they have come in contact with, or been near. Blogjects have attachments associated with those traces. Where our Blogjects go, someone always knows. Human agents might make meaning of the traces of their luggage as a historical documentation of their travels. Security may turn luggage into field agents that record histories of encounters with the luggage of other people, perhaps people of



Real time, web-accessible tracks of the movement of some of the most prolific Blogjects — aircraft. Between the FedEx aircraft, tracked through sophisticated air traffic and operations management systems, and the cargo of moment-to-moment trackable parcels within those aircraft, FedEx may be today's canonical instance of Blogjects. How else can we make use of the Internet and Things to do more than bring operational efficiencies to shipping companies?
http://www.flightaware.com

concern, or luggage that is suspiciously "anonymous" or that has traveled to questionable territories with regularity.

Our luggage has already asserted itself during our intraplanetary travels. The most efficient traces of luggage keep it with us, wherever we go. I have not had luggage loose me for close to a decade, although I don't travel a great deal so I might not be the best litmus test for the Blogginess of luggage. But recently, a colleague recounted the story of a bit of nuisance luggage that lost its human. It seems the trace characteristics of the luggage Blogject left a trail toward Milano, Italy when the destination of the human was Barcelona, Spain. In fact, the luggage was on its way to Milano and so its human was duly re-routed as well, beyond its will. In the Internet of Things, Things, it is not human agency alone that shapes the way we occupy and move through space.

How Stuff Is Made (HSIM) is a visual encyclopedia that documents the manufacturing processes, labor conditions and environmental impacts involved in the production of contemporary products. It is a free, independent, academic resource published by engineering and design students, who research and produce summative photoessays describing these conditions of creation. Academic faculty are responsible for ensuring that appropriate standards of evidence are upheld, and guide the students in collaborating with interested manufacturers. HowStuffisMade (HSIM) reconsiders engineering / design education as fundamentally connected to the social and political constraints, organizational innovations and global context that inform manufacturing decisions.

History — Blogjects Know From Whence They Have Arrived

History is the remnants of experiences Blogjects acquire. It is a way to reveal and share those events, proximity-based interactions and encounters and disseminate them, or leave them behind in particular locales as a way to "fill in" traces with semantic or even just instrumental remarks. Ideally the history is embedded, rather than indexical, so that Blogjects physically contain the full record of their experiences, where they oc-

curred and with who and what. The barcode, for instance, is indexical in that it is a reference to information located elsewhere. Many Arphids are indexical in the same fashion, although newer units have storage built in which could be used to persist historical data within the actual device.

The web encyclopedia "How Stuff Is Made" anticipates the kind of embedded event histories that we would want our Things to contain, such as manufacturing processes, labor conditions, environmental consequences and so on. This kind of history of Things (synonymous, perhaps, with "Stuff") has the consequential character of telling a story about their making, about their past. Blogjects, like Spimes now about their conditions of manufacture, including labor contexts, costs and profit margins; materials used and consumed in the manufacturing process; patent trackbacks; and, perhaps most significantly, rules, protocols and techniques for retiring and recycling Things. Things can't just stop describing themselves with a list of ingredients or country of manufacturer or an RFID that merely spits out an encrypted uniform product code — that just is not ontologically satisfying. This is like best practices for open source, object-oriented software design for Things that are physical, tangible and take up space. Objects, like their ephemeral, software kin, should be self-describing, they need to let us know what they are, what their API touch points are, how to construct them and how to destruct them.

Agency — Blogjects Are Assertive

Agency is perhaps the most provocative aspect of the Blogject feature set. Agency is about having an ability to foment action, to be decisive and articulate, to foment action. This isn't the Terminator fantasy of machines with guns that run amok, acting against humanity. The Blogject capacity for producing effects is far more powerful because it has always been pervasively, ubiquitously, everywhere tethered to the far reaching, speedy, robust network of social exchange and discourse that humanity has every constructed. In the Internet of Things, that kind of

agency happens within the ecology of networked publics — streams, feeds, trackbacks, permalinks, Wiki inscriptions and blog posts.

Agency as I am using it here does not just mean a local “artificial intelligence” that makes a Blogject able to make autonomous, human-like decision or fashion croaky human-speech from text. Blogjects have no truck with the syntax of human thought. Things could not care any less about their Turing Test report card. Blogject intellect is their ability to effect change. Their agency attains through the consequence of their assertions, and through the significant perspective they deliver to meaningful conversations. Blogjects bring something heavy to the table. Or, they are brought to the table because they have semantic weight.

Agency is literally imbued in Blogjects. Things that matter completely sully the previously starched white relationship between subject and object, human and non-human. Things that matter inflect the course of social debate and discussion, and material effecting local and global change. Witness the Spotted Owl. Witness the Pacific Northwest Salmon. Witness all the non-human, non-subject "things" that became fully imbued with the status of first-class citizens. Heck, most humans don't have the capacity to effect the kind of worldly change and receive the same order of protection, status and economic resources *as a fish*.

Why Things Matter?

For Cohabitation — The Question of Space and Place

The Internet of Things brings many vectors together — pervasive networks, the miniaturization of networked devices, mobile communication, the refashioning of physical space as we cohabit and co-occupy space with Things. When the network that has facilitated a profound, unprecedented knitting together of complex, multivalent social formations seeps into a space — the physical, geospatial world — which was previously void of such, what does it all mean? When it is not only “us” but also our “Things” that can upload, download, disseminate and stream meaning-

ful and meaning-making *stuff,* how does the way in which we occupy the physical world become different? What sorts of implications and effects on existing social practices can we anticipate? How does our imaginary skew when we think about how we might move about and occupy future worlds alongside of objects that blog and other Spimey creatures?

When we think of the kind of social networks that the Internet facilitates, we think of human agents participating in an exchange of ideas, centered around meaningful topics, whatever they may be. Until now, “objects" and “things” have been conspicuously absent from this sphere of making culture. When considered in the context of a pervasive, ubiquitous, everywhere Internet — an Internet that spills out beyond the tethered connections and local WiFi hotspots to consume nearly every corner of the physical world — the idea of objects in that physical world, now able to network, communicate and participate in the social web becomes a tantalizing consideration for novel designed experiences.

Things with informatics and networking capabilities anticipate a transformation in the ways social practice “fills in” space by their mobility and their physicality. There is an important difference between an object that consumes and occupies space as an inert thing, and a Blogject that is able to capture information about the happenings in its surroundings, communicate with other informatic social beings and disseminate all of that anywhere in the world. We already know about security

cameras and the concerns over privacy they pose, not to mention the ways they often make us think about our patterns of movement and practices for occupying physical space. The prescient emerging technologists known collectively as the Institute for Applied Autonomy created a wonderful instrument called iSee that we might consider the Google Maps for the Internet of Things.[1] iSee contains a DIY database of surveillance cameras in the supremely pedestrian New York City and some route finding software not unlike that used by Google Maps, and plots routes so as to avoid the maximum amount of exposure to cameras. iSee anticipates a world in which every flickr'ng camera is capturing real-time imagery from all over the networked world. How do you avoid being flickr'd? How do you insure that you get flickr'd? Will flickr'ng cameras self-aggregate their photographic coverage, automatically discovering the flickr feeds of all the other cameras that were nearby them — at the fireworks show, or during the firehouse picnic — using NFC or Bluetooth proximity-based networking?

First video, then networked video. How do the terms by which we occupy space change when we share space with increasingly observant and participating Things? We may now be used to closed circuit video surveillance, but networked video surveillance — where anyone anywhere can see what's going on — rewrites the rules of our tenancy within physical space.

We might think about the way Blogjects might operate in a similar fashion to capture and reorient physical space and thereby alter patterns of movement and oc-

1 http://www.appliedautonomy.com/isee.html

cupancy within space. Michael Naimark and a team at Interval Research developed the Kundi project, a great example of a project that anticipates how the Internet of Things and Blogjects become a platform for reframing the meaning and the rules of occupancy of physical space.[2] The Kundi framework is deceptively simple, and a testament to the foresight of the development team. With Kundi, connected Things (they were, in this case, webcams capturing images of the real world) could have their content tagged as "hot" and draw in attention from anyone on the Internet. There are ludic scenarios, of course — it wouldn't be an Internet project if there weren't. But there is one usage scenario I've heard Mike mention more than once — a Kundi Cam placed in a refugee camp where rape and murder are routine. Now imagine that the Blogject version of the Kundi Cam has a visible indicator showing how many tens of thousands of people around the world are watching at any given moment. Behaviors change, threatening space edges towards safe space because Things are enrolled in the social web thicket.

Our occupancy in the world changes when we enroll Things amongst us *in* the social web. How will the rules of tenancy *within* the physical world change when our Things — physical objects — are informatic and networked? How will my behavior and my conception of physical space alter when the Internet pervades not only all the little nooks and crannies, but is accessible to all my little trinkets, my cereal box, my wallpaper, my ring?

(Parenthetically, we'll have to begin choosing our prepositions with care — we are now in an era of pervasive networks and are thus more properly "in", not "on" the network. Careful choice of prepositions that help us orient matters deeply, and it helps think more clearly about not only the stakes of cohabiting with Things *within* the networked world, but also for thinking about how to design experiences for this very different mode of occupancy.)

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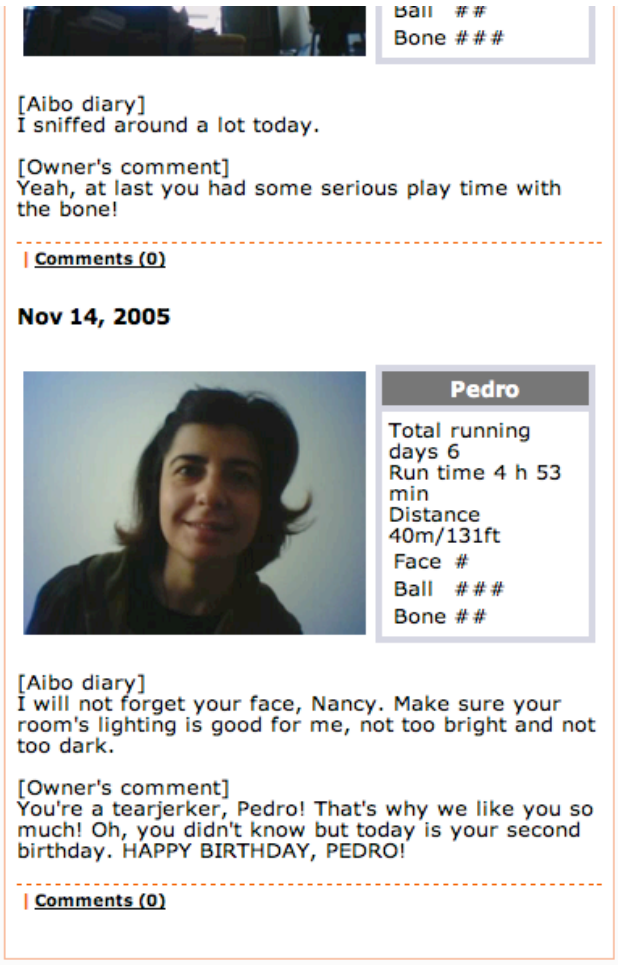
2 http://www.naimark.net/projects/kundi.html

What about the other cohabitants that will now have the ability to get on the network within this pervasively networked future? Critter cams that disseminate a realtime video stream from a Kapok tree in the Amazonian rain forest or an RSS feed and podcast from a school of migrating whales showing all kinds of meaningful environmental data would definitely make it into my news aggregator. What difference would that make to how we cohabit physical space, how we understand the impacts our tenancy has? What difference do other blogging species have on how we understand how the world works, or how we work to change the world?

Space itself has been refashioned as a consequence of Spimey, blogging objects. Jeffrey Huang, an architect who has devoted considerable attention the role of physical objects as digital interfaces, focuses his research on the ways in which the spaces we occupy are transformed by the introduction of architectural structures that are networked. Huang is noted for being both an architect and an Information Technology expert, so his eye is drawn to the ways in which structures, such as the massive, incredibly instrumented and networked distribution centers that have arisen (even with their own airports!) to support the "bricks-and-clicks" online retailers, like Amazon. It is not only their physical dimensions that are massive, but the density of the net-



work transactions that occur within them, triggered via the simple click-click actions by underwear-clad insomniac shoppers at the edges of the network. Amazon distribution centers are one of the places where networked Things come to be. Clicks become boxes of books and electric shavers, all duly logged and traced through the equally massive networked operations of parcel carriers.

Huang's confluence of architect and IT expertise is prescient in an era in which structure, boundaries and paths are increasingly determined by where the network is, and where desirable networked actions and behaviors can be found. Who doesn't know where their own cellular operator's "dead zones" are? Or what cafe has good, cheap and thick WiFi bandwidth?

For Co-Participation

Occasionally objects, things, non-humans, non-subjects step out of their thingness to become more than lifeless props. Things can learn to walk upright, too, so as to distinguish themselves as valued companion species, with something to say, something to effect our disposition and attitude about our (we humans) role in managing and maintaining, or mismanaging and terrorizing the world in which we live. The Sony designers who created the firmware upgrade for Aibo may have been unwitting participants in the Blogject evolution. The new version of the Aibo — a species whose future is uncertain — can take pictures of what it sees and establish a running blog of its whimsical musings. It's hard to resist the significance of the extrapolation of this idea, particularly when thought of in the context of our elaborate and bizarre kinship associations with domestic pets — arguably our closest companion species. Pets that blog are just the 21st century, networked world extension of the sometimes puzzling practice of giving pets "human" names like Bill, or referring to them with decidedly human kinship semantics like daughter or brother. As long as they have a network connection, why shouldn't they get their

Web 2.0 upgrade and participate in the circulation of media and content? Things now have a voice in the collective of human social exchange.

The first-order consequence of the Internet of Things is a network in which socially meaningful exchanges takes place, were culture is made, experiences circulated through media sharing — only with objects along with human agents. Whereas the Internet of Non-Things was limited to human agents, in the Internet of Things objects are also active participants in the creation, maintenance and knitting together of social formations through the dissemination of meaningful insights that, until now, were not easily circulated in human readable form. The important aspect the Internet of Things is not only that Arphids and data transponders are now connected onto the Internet, any more than the significance of the web of social networks was MovableType blogs and SocialText Wikis. The significance of the Internet of Things is not at all about instrumented machine-to-machine communication, or sensors that spew reams of data credit card transactions, or quantities of water flows, or records of how many vehicles passed a particular checkpoint along a highway. Those sensor-based things are lifeless, asocial recording instruments when placed alongside of the Blogject.

Just like the motivation of the "alpha" blogger, the character of the motivated Blogject is to make, disseminate and enhance meaning, to draw attention and to be assertive. Like the alpha blogger, the Blogject enters into conversations that yield consequences. Its not at all interesting to have my car "blog" routine things such as the routes I've driven, its time-average fuel consumption, or the street address of a restaurant I've just passed that has a menu that would appeal to my palette based on previous restaurant experiences. It is much more consequential, and much more assertive of a first-class participant in the network of social discourse for flocks of vehicles to provide macro-scale insights into how much fuel is consumed hourly

on Interstate 405 in the Los Angeles basin, or how many tons of pollutants are exhausted into the atmosphere every hour.

The social and political import of the Internet of Things is that things can now participate in the conversations that were previously off-limits to Things. That's not as manifestly grand a statement as it may seem. It means, in simple terms, that Things, once plugged into the Internet, will become agents that circulate food for thought, that "speak on" matters from an altogether different point of view, that lend a Thing-y perspective on micro and macro social, cultural, political and personal matters.

The promising, exciting news around the Internet of Things cannot possibly be the "cool" factor of having my toothbrush connected to the network so that the Proctor & Gamble people knew when I was low on toothpaste. Design agents were always smarter than that. What if our RSS aggregators could tune into feeds from Amazonian forest and the daily clear-cut blog? Or critter cam video blogs that show us how really nasty seal bulls can be to their pups when they're not playing their circus act at Sea World. And video blogs from schools of dolphins and whales that will make it increasingly difficult to ignore the plumes of toxins in the oceans and the slaughter of their kin by whalers and felonious fishing fleets.

This manifesto isn't about predicting the future. This is a design imperative. I'm not saying this will happen — that birds and dogs and chairs and shoes will begin blogging and take over the world. I'm saying that design agents should think hard about the opportunities for creating more lively engagements with Things, enrolling them into the thick, contested and messy imbroglios of trans-species dialogue that lead to more habitable worlds. Let the Pigeons help us speak on the environment. Let Poultry get us to think seriously about a world where the H5N1 virus takes charge. Let Automobiles have a say about their fossil fuel consumption habits.

Forget about the Internet of Things as Web 2.0 and networked Barcaloungers. I want to know how to make the Internet of Things into a platform for World 2.0. How can the Internet of Things become a framework for creating more habitable worlds, rather than a technical framework for a television talking to my refrigerator? Now that we've shown that the Internet can become a place where social formations can accrete and where worldly change has at least a hint of possibility, what can we do to move that possibility out into the worlds in which we all have to live?