WEB THREE POINT OH: THE VIRTUAL IS THE REAL

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by Virginia Kuhn

Web 3.0 seems so full of promise: If Web 2.0 replaced the static, client-based internet with a dynamic social web, Web 3.0 promises to expand the affordances of digital production, giving rise to increasingly complex modes of visual and aural representation, as well as to expand the networking capabilities that will replace the relative stability of desktops and databases with clouds and information flows.[i] Web 3.0 will be the Deleuzean "body without organs," materializing human perception via stimulus-response, while more closely mimicking the organic pulse of the natural world. The brain becomes the neutral space in which the material and the immaterial meet and negotiate their terms. However the brain also becomes the control center, the mediator of the real and the virtual. So while there are at least three variations to the hype about Web 3.0, they all rely on the underlying view of the brain as the prime and only loci for a presumed human desire for transcendence. We humans seem hopelessly controlled by our brains and we are devoted to mapping their autonomic functions sufficiently for the twin purposes of exteriorizing our thoughts (via better representation), and interiorizing our lived experience (via deeper reflection).

I heard the first allusions to Web 3.0 several years ago and as the references became more frequent, I began mapping their contours.[ii] These remarks, often fleeting and mostly informal, issued from different communities, and so their views and goals also differ vis-à-vis Web 3.0. And while these approaches are by no means discrete—often they rely on the same technical functionality: a better tagging process, for instance, informs all three—their differences are worth considering for their exploratory potential. The first approach characterizes Web 3.0 as the move from an indexical web to a semantic one, which will provide a dynamic and seamlessly connected information flow born of collective intelligence: Wikipedia on steroids. A second stance focuses on improvements in graphics processing which will provide ever more immersive experiences in virtual worlds such as *Second Life*, *World of Warcraft* and other MMORPGs (massively multiplayer online role-playing games). Finally, the third stance positions Web 3.0 as the overlap between the material world and information about it: data embedded into its structures. This "web of things" is brought about by hand held GPS, augmented reality, and especially RFID tags (radio frequency identification), all of which are dependent on an infrastructure that has nearly unlimited uniform resource locators that can be assigned to objects. Obviously, each approach deserves and demands its own longer meditation; here, I simply wish to gesture to a few key issues in the evolution of the internet that seem especially provocative.

The Semantic Web

The shift from an indexical web to a semantic one relies primarily on structure achieved by the addition of context to coded data in order to facilitate machine-readable web pages, which can be indexed, archived, and searched in ways that are useful to humans. Quite simply, the capacity for creating web pages far exceeds the ability to manage them. Indeed, with billions and perhaps trillions of pages—every digital artifact, from a blog post to a Tweet to a video, constitutes a discrete "page"—any type of comprehensive search is impossible. Web pages constructed in HTML are often invisible to search engine algorithms, in part because the code does not separate content from form. Since HTML presentation tags are blended with content tags, a computer cannot distinguish between a command for rendering (e.g. bold or italics) and the actual word to be rendered. Proponents of the Semantic Web maintain that just as with verbal language where the real meaning of a word lies in the words around it, so too the relational databases of the Semantic Web will help give meaning to data by providing context. With enough metadata and linking structures to show relationships, they suggest, massive data flows will be made useful. Unsurprisingly, many computer scientists advocate extreme structure.

Conceptually, the move to the Semantic Web might be seen as a recursive one: Generalized Markup Language was created in 1970 before becoming SGML (standard generalized markup language) in 1986, and this language allowed for the "grammar" of web pages to be parsed. Then in 1990, when Tim Berners-Lee created HTML, the two became merged. Bill Cope calls this move an "abomination" on the part of Berners-Lee and argues that the history of HTML since its inception has been little more than a series of correctives for this conceptual mistake. Indeed XML (extensible markup language) and CSS (cascading style sheets) attempt to provide a layer of abstraction, adding both structure and semantics to code. Moreover, Berners-Lee, perhaps partially as a corrective, founded the World Wide Web Consortium (W3C) in 1994 for the express purpose of creating standards for the web.[iii] Standards are necessary in order to locate information, particularly when so many diverse constituencies with differing notions of categorization create content, and this is compounded in a networked environment dependent upon linking systems. Beyond the need for search and retrieval functionality, separating content from presentation allows for variable rendering of pages, such that a page can be viewed the same way across browsers and platforms. This gives the web author control of the look of a page, but also reminds us that the way something looks impacts the way it makes meaning. Mobile devices are gaining huge prominence, and their disparately-sized displays require variability of rendering, and this provides a compelling argument for structural semantics.

The Semantic Web also has its critics, and their arguments are equally compelling, particularly with regard to the premise that constructing ontologies is, in essence, an effort to squeeze knowledge into data, which is organized according to a very particular (and monolithic) set of values. In 2003, Clay Shirky lodged initial complaints about the Semantic Web, arguing that its structure relies on syllogisms, whose logic is notoriously difficult to assess, and often faulty. Further, he claims, metadata is notoriously inconsistent, and an aggregation model can accomplish similar goals rendering metadata extraneous.[iv] More recently, Shirky has called the Semantic Web a "witness protection program for AI researchers," since it facilitates the revision of their foundational mission of trying to build a machine that thinks like a human, to the current effort which is to "describe the world in terms that machines [are] good at thinking about" (Ray, 7:53). This, he continues, gets to the real issue as the question becomes: Is there a single reality or do humans construct their own reality in order to make sense of the world? Of course the corollary question is: How limiting will it prove to force knowledge into an algorithm?

Like any language, code dictates what may and may not be expressed through its structures. Further, since the processes by which information becomes knowledge are historically and contingently situated, an epistemology based exclusively on a form of database mentality becomes problematic indeed. For example, words do have a graphical facet, and their form does weigh on their meaning, so perhaps unhooking them from these contextual elements is not always appropriate: Maybe **V** and V and *V* should be discrete symbols. And, ultimately, the dislocation of the message from the medium is a thorny issue, as Marshal McLuhan long since argued. No vehicle is ever neutral and so understanding *how* a particular mode signifies is vital for critical literacy. However, this partitioning does not have to suggest that an ideologically neutral vehicle exists; rather by separating code from its content, we might better apprehend the ways in which information is constructed from data. Splitting form and content may facilitate an interpretive framework and, by harnessing the hybrid power of human and machine reading, may add nuance to information and to the production of knowledge. This is what proponents of a "scruffy" web endorse, contending that a little bit of structure can go a long way when paired with the wisdom of a human (Bernstein in Ray, 9:47). The results will be murky, but they will also demonstrate that knowledge cannot, and *should not* be codified.

This murkiness is absolutely crucial in order for projects to emerge from creative and critical culture. Craig Dietrich and John Bell argue that the best way to reconcile the disparity between "cultural protocols" that are nuanced and "rarely fully definable," and computer programming, which demands information generalization and structural regularity, is to create small custom projects developed by deeply collaborative interdisciplinary teams. Large-scale developers, they note, seldom have sufficient interactions with cultural workers; moreover, the very mission of corporate development is the creation of one-size-fits-all platforms, which can be widely reused. The resulting readymade software lacks the degree of customizability necessary for nuanced projects. Thus, content is inevitably homogenized since it must be squeezed into the software's default parameters. The alternative, Dietrich and Bell argue, lies in existing semantic technologies that are more loosely structured. For instance, small-scale custom projects that use Resource Description Frameworks (RDF) can exploit functional complexity because they can be plugged into larger platforms, yet their ties can remain loose enough to retain agility: The smaller component can be removed, updated, or completely reengineered without compromising the larger platform.

To be sure, these agile collaborations capitalize on the differing strengths of humans and computers, bringing cultural concerns to bear on programming choices and capabilities. The resulting projects can counter the static nature of machine language, and encourage the progression of rigid code structures into something more dynamic. But this hybrid method can be a double-edged sword when massively scaled since the cultural governors are not always retained. In *Recognition Markets and Visual Surveillance*, Ryan Shaw observes that while most of us are aware of the ubiquity of surveillance equipment, we also tend to think we can "hide in plain sight" due to the sheer volume of images these technologies beget. Thus, we do not mind being seen, because we seldom think we will be recognized. And this mindset can have serious consequences.

Humans are far better at facial recognition than are machines.[v] This awareness has given rise to several large projects that encourage users to label digital photographs of their friends. Shaw narrates an event in which thousands of students who gather each year in a University of Colorado football field to smoke marijuana in commemoration of April 20, a date whose numbers, 4-2-0, are code for the drug, were photographed and, when university officials decided to crowd-source photo labeling, most students in the field were identified. The image labelers were promised pay for their semiotic labor, which no doubt provided a powerful incentive among college students.

University officials created a "human-machine hybrid technology of image recognition," of a type that is being deployed by many institutions under the guise and incentive of "security," from policing immigration at US borders, to airport screening of terrorists (Shaw, 8). We can see similar trends happening on the behemoth site that is Facebook, for example, where, in typical privacy-violating fashion, users were served up photos of their friends and encouraged to label them *before* any type of announcement was made about Facebook adopting facial recognition algorithms.[vi] So while this tagging may seem to be a relatively innocuous activity, its aftereffects are consequential in their unpredictability, especially given the massive scale at which peer networks operate. The scale makes these endeavors categorically different from other recognition efforts such as FBI Most Wanted posters (Shaw's example), or even the more distributed mode of placing missing children's pictures on milk cartons. As Shaw concludes, there is a serious need for carefully considered protocols for the labeling of images, as well as for transparency about their future use: If I label an image and am told it will be private, and that no human will look at it, might it still be subject to machine reading unbeknownst to me? If so, will an aggregated version of image identification—say, a composite profile of someone's activities based on multiple machine read images which are then shared with authorities—still not violate the terms of such privacy, even as it surely violates the spirit of the agreement?

This is not a trivial issue in the context of the current cultural moment, that which is characterized by volatile power shifts and institutional instability. And while it might be ludicrous to suggest that Twitter spawned a revolution in Libya or in Egypt, regimes that harness this type of human-machine image recognition process should give us all pause. The open nature of networks and the enduring nature of the data put on them, means this information may be appropriated by institutions whose motives and intentions simply do not align with those of the original. In this climate, even the tactic of mislabeling one's photos in order to cast doubt about the authenticity of any such image—a strategy that many of my colleagues began deploying several years ago in a move that was often seen as paranoid—is rendered futile in a culture of constant surveillance. At my university, for example, a camera perched in a tall building above the main square of campus continuously records activity there. The convivially named *Tommy Cam* feeds real time images, as well as time lapse recordings of previous days' footage, to a publicly available feed on the university web site. One must take great pains to conceal one's likeness if she wants to teach or learn here. Moreover, as image processing advances, so too does the capacity for altering them, and while many people believe themselves to be media savvy, photorealistic representation is still widely seen as documenting real events, with little if any mediation. Complicating the degree to which a camera de-territorializes images, in Deleuzian terms, and the ways in which human-machine dyads can re-territorialize them becomes an especially crucial line of inquiry, and might offer at least a partial remedy to surveillance culture. Perhaps it is no surprise then, that the production and impact of images becomes key to the second version of Web 3.0.

Visual Saturation | Imageworlds

Visual information forms the crux of this version of Web 3.0, as improvements in graphics processing units (GPUs) allow sophisticated "image-worlds"[vii] to be rendered dynamically. Cloud computing architecture is being reconfigured to accommodate these more powerful GPUs, allowing the heavy graphical load of visually mediated spaces to be networked. As a result, virtual worlds synchronously connect many people in more seamlessly dynamic ways. The virtual co-presence this allows is markedly different than asynchronous connectivity, and this may well be the most profound shift in Web 3.0 technologies since it centers on humans and not machines. Concomitantly, moving images become accessible from mobile devices whose wireless functionality increases, such that viewing media is not anchored to a single physical location; representation is nearly as ambulatory and portable as are people. And as the visual landscape becomes increasingly mediated, its impact on human existence is a source of copious research, much of it complicating the very nature of materiality. Thus, not only are we creating and viewing more visual media, we are imaging brain scans to understand neurological responses to this highly mediated world. Numerous recent books engage brain research and speculate about its implications for how humans think and feel, and this research is made possible largely by fMRI scanning (functional magnetic resonance imaging), which creates a snapshot of the brain's structure. Scanning is also used to track changes in brain activity while subjects are actively engaged with visual media. But these scans are themselves mediated representations, a feature that often goes unremarked, and they require the same interrogation as do all visual symbols.

The basic assumption of scanning technologies is the belief that the brain and its functions can be translated into data and, as Ron Burnett argues, the "philosophically powerful suggestion that it might be possible to understand the human mind through imaging technologies says more about images and human desire than it does about thinking" (*xx*). A recent project exemplifies this impulse perfectly: a team at Denmark's Milab created a "smartphone brain scanner," whose tagline, "holding your brain in the palm of your hand…" speaks volumes about the human impulse to understand the brain in general and emotions in particular, through imaging. This device works with EEG technologies via nodes that attach to one's scalp, the impulses rendered via 3D modeling sent to the attached mobile phone, for the express purpose of charting one's affective response to images.[viii] The accompanying forty-second video demonstrates its usage, one a brief foray into the Kuleshov effect (response to an image based on which images precede it), as well as a group of seven node-clad men grasping their smartphones (to track responses to social situations), both of which indicate the device's use as a type of biofeedback endeavor. One cannot help but think that reflection might accomplish the same type of task without the mediation of the apparatus. Indeed, asking the conscious brain to interpret representations of its autonomic functions is an interesting proposition.

At the other end of the spectrum of the brain-computer analogy, lies the Spiking Neural Network architecture project (SpiNNaker), an attempt by a group of UK researchers and supercomputing scientists to simulate the brain via supercomputing. This is where the basic differences between brain and computer are seen most clearly. As *HPC Wire's* Michael Feldman notes, "the view of the brain as a biological processor (and the processor as a digital brain) is well entrenched in popular culture" even though their "designs are fundamentally different." Indeed, not only are there huge architectural differences between brains and computers, their processes are equally disparate, so while the SpiNNaker project will construct a 50,000-node machine with up to one million processors, it is expected to only mimic one percent of the brain (Feldman). But brains use both electrical impulses and chemical reactions, so one might question even this tiny percentage; while computers might be able to mime electrical impulses, it is hard to see how digital processors will ever become facsimiles of an organic structure that uses these biomolecular processes, even if nanotechnology renders blood cell sized computers.[ix]

The brain's rational, logical, and precise processes are fathomable and the algorithms we have built illustrate this, but the ways in which emotions work are far more mysterious. Images tend to operate on the affective level in ways that are sometimes hard to predict and always difficult to discuss in rational (linguistic) terms. Riffing off of Roland Barthes, Gregory Ulmer describes the concrete impact of the punctum: when viewing particular images, he asserts, "I have a very real experience in my body, an emotional pathic response, and it is at this point of the me that the discursive abstract information and my unique existence overlap" (62). The nature of this "discursive abstract information" attempts to account for the differences between more generalized cultural responses to images, and the more personal and often idiosyncratic reactions based on one's lived experience. In a slightly different approach, Brian Massumi distinguishes between *affect*, which is autonomic, collective, and atmospheric, and *emotion*, which is personalized, namable, and consciously problematized.[x] Unlike the studium-punctum formulation, Massumi explicitly separates image content from image effect, suggesting there is no straightforward relationship between the two. But this concept leads to political quietism since the assumption of an autonomic response, one that lies below the threshold of cognition, can then be seen as idiosyncratic, such that no theory can be applied. Further, as Ruth Leys points out, content is then not seen as being ideologically imbued. In other words, this approach, by extension, removes any ethical onus from the image creators.

Even as the operational details of the process remain unclear, we do know that emotions trigger physical reactions, making viewing images an embodied experience. Thus the role of *affect* frequently fuels neuroscience research as the brain mediates bodily responses to vision. Scientists are currently exploring what critical theorists have long known: not all images are equal in terms of the physical reactions they cause and their impact on identity (Arbib, Damasio). And while MRI scanning may not be able to represent human thought, it can shed light on certain emotional responses to images, especially with regard to the role of mirror neurons.

Mirror neurons are those that fire in the prefrontal lobes of the brain when one acts or is acted upon, and they also fire when one only witnesses the same act exerted upon another, especially if the other is similar to oneself. These neurons also seem to fire when one only sees a representation of the act, implying that under some circumstances, the brain cannot distinguish the experiential from the imaginary (Goldstein). There is some debate with regard to the role of an inciting incident and whether it must precede the activation of the mirror neuron; it is not clear if one must have experienced the act before one's neurons will fire when only viewing a similar act, or if they fire absent that initial experience. Is it necessary for me to have known the anguish of having my fingernails torn off before my neurons fire by watching it happen to someone else? Obviously this distinction holds implications for mirror neuron response, which is seen as an empathetic one.[xi] Still, the very awareness of mirror neurons, when paired with the concept of neuroplasticity—the evidence shows that the way we use our brain impacts material structure as some synapses are pruned away, while others are strengthened—makes attending to what goes into our brains through our eyes a concern, particularly for media scholars.

When considering graphics processing then, exploring human perception via the eye becomes crucial. Thus, there is an ethical dimension to the creation and use of media in general, and of interactive media in particular.[xii] For instance, as graphics processing advances, first person shooter games may work on brains in ways we do not, and perhaps cannot, fully appreciate. Is it ethical to foster gameplay that includes increasingly realistic images and that requires violence for success? Does virtual violence become an outlet for real world frustrations, providing catharsis, or does it create neural pathways that routinize adversarial interactions? And what about the virtual people who populate the landscape of these games? Killing differently-appearing avatars is typically the main goal as "bad guys" are visually marked, but since mirror neurons seem to fire most strongly when one views an act upon an actor who is similar to oneself, how far must an avatar vary visually from a player to make killing it an additional ethical imperative?

As *Slate* editor Michael Thomsen argues, there is a disconnect between the realistic warfare of games such as *Battlefield 3, Call of Duty: Modern Warfare, Medal of Honor and Operation Flashpoint*, and the erasure of civilians in the gamespace. Thomsen cites *Battlefield 3's* executive producer Patrick Bach who, by refusing to add civilians to the game, says he is "sanitizing" the medium. Bach claims that players cannot be trusted to do good if they can do bad, which necessitates this cleansing, and he blames players for holding the medium back. Thomsen, however, indicts Bach and his fellow developers with holding the medium back, since they refuse to force players into ethical dilemmas wrought by the consequences of the act of harming innocent bystanders.

What would it mean to make players confront such dilemmas, and would these moral quandaries impact real world actions? Restricting or censoring games is obviously not the answer, and indeed can make them more attractive by virtue of their forbidden quality. Perhaps some regulation is viable; in 2011 the International Red Cross began talks around the possibility of recommending the application of the Geneva Conventions to gameplay.[xiii] Critics invoke the triviality of such a move, since "it's only a game." They also invoke axioms about "mind control" and "thought police," while studio executives espouse their reverence for their developers' artistic vision (one might ask about the degree of finesse possible since the generic conventions of *Call of Duty* and *Battlefield 3* are relatively rigid). And while limiting free speech is not typically associated with a thriving public sphere, there are certainly precedents for such regulation: libel and hate speech, for example. A fuller appreciation of the ways in which the digital and the material overlap might clarify such issues and also may highlight the need to regulate the sale of large-scale surveillance technologies. These currently remain unchecked, and yet given that their primary raison d'etre is to aid espionage and combat, they ought to be subjected to arms control.[xiv] Moreover, these surveillance technologies have transformed warfare into an ersatz video game, as remote operators pilot drones, dropping bombs from a safe distance. This places an even darker spin on *Call of Duty: Modern Warfare 3*, a game that grossed one billion dollars in sales during its first month on the market.[xv]

Obviously, game systems could be scripted to punish players who shoot civilians, a move that seems consonant with the ever-more realistic graphics. But even in the absence of the requirement to do so, we ought to be engaging these games far more critically. This includes exposing their producers to rhetorical scrutiny inquiring, for instance, about how they posit their audience. Discussing the extent to which they seem to have zero faith in their customers' collective moral compass may appeal to players' righteous indignation. We might challenge players to traverse the aporia-epiphany path, wherein an impasse gives way to closure (Aarseth), which may prove far more motivating than remaining in the simplistic environment of this "sanitized" medium. A reflective approach like this may also enrich cognitive research, as players grow increasingly aware of the impacts of gaming, and better able to articulate their experiences.

To be sure, research in this area is sorely needed and one avenue that could shed light on the effects of first person games comes by way of those working in the burgeoning area of neurocinema; researchers scan subjects' brains via fMRI while they watch various films to try and gauge responses, which occur below the level of consciousness. For instance, Pia Tikka is a key researcher behind the enactive cinema project [http://www.enactivecinema.net/], whose various iterations have included efforts to match the cinematic narrative to the spectators' reactions, but which have lately focused on measuring the responses to tenable situations and contrasting those with reactions from viewing scenes that defy the laws of physics, for instance. If the brain cannot tell the virtual from the experiential, how will it activate when faced with the impossible?

Any of these speculations about visuals and brain science must also consider two aspects of this research that typically go unremarked: first is the fact that one can tell very little about how the brain scan activity is actually experienced, so scientists must rely on their human subjects to narrate the experience and assume fidelity between what they can articulate, and what the scans seem to show. Rather than a hard and objective fact, these scans reveal widely interpretive frameworks and they are desperately in need of sustained interrogation. Secondly, however, nearly all neuroscientists find that even a short-term change in activity has significant impact on the brain's wiring. The hardware itself seems dynamic beyond expectations, and certainly renders the brain-computer analogy faulty.[xvi] This makes pinning down a scan for analysis a pretty dicey matter, while it also suggests the need for attending to the uses to which we put our brains, knowing that this use shapes them.

Ubicomp | Augmented Reality

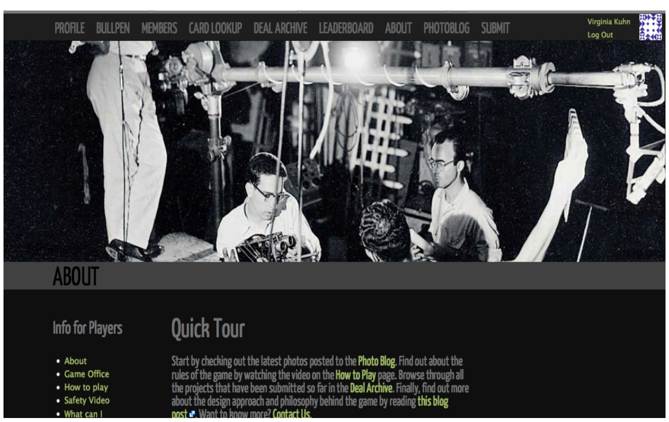
If the brain is the conduit linking images to bodies, the third version of Web 3.0 occurs at the boundary between the material world and digital information about it. Computing was once a many-to-one enterprise—many users connecting to a single mainframe—but the relationship is rapidly moving toward the inverse. Personal computers closed the gap forming a one-to-one equation, and this is gradually becoming a many-to-one enterprise, as several mobile devices are possessed by a single person. The combination of these mobile devices, improved graphics processing and wireless connectivity, along with QR coding, RFID tags, and geospatial mapping platforms, renders both ubiquitous computing and augmented reality eminently more plausible.

Prominent interactivity designer Adam Greenfield argues that ubiquitous computing "has already staked a claim on our visual imaginary, which, in turn, exerts a surprising influence on the development of technology" (93). The basic tension, as Greenfield notes, arises from the ways in which good technological design hides itself and "dissolves in behavior," on the one hand, but also must be transparent, self-disclosing and optional on the other, in order to protect people from its less savory affordances. Motivated by the "technologically sweet" challenges inherent in the creation of ubiquitous computing systems, designers do not always prioritize a humane set of values on which these systems are built. Further, ubicomp (which Greenfield dubs "everyware") tends to colonize everyday life—from turnstiles with card readers that can penetrate one's purse, to toilets that analyze one's urine, sending the information to health care providers (and the police? insurance companies? parents?), Greenfield argues that the new Foucauldian gaze is no longer visual but biometric, computational, algorithmic and, as individual systems are linked, spreading their data exponentially, the gaze becomes environmental. Likewise, this new gaze is essentially "eternal" because once we let these systems into the world, we will have a very hard time removing them (25:04). Greenfield argues vehemently for a set of principles that should guide the creation of any ubicomp system: it must default to harmlessness; it must be self disclosing; it must not embarrass humans; it must be conservative of time with no unnecessary complexity; and, finally, it must be deniable in that there must be an opt out mechanism.

Until fairly recently, the potential of these systems has been partially hindered by structural limitations. The number of available web addresses allowed by Internet Protocol version 4 (IPv4) has been dwindling for some time. Recently the situation became critical, prompting the move to adopt IPv6, which will eventually phase out IPv4. Today's devices—"smart" phones, iPads, e-readers and laptops—require individual addresses due largely to their mobility; they move with their owners and so there is no guarantee of proximity to a home base where a single IP address might be adequate. Vinton Cerf, co-creator of IPv4 and one of the "fathers of the internet" noted that he saw the initial batch of web addresses as adequate, thinking as he did, that the original internet was an experiment, a prototype of sorts, designed for the very limited group of ARPA Net users. Cerf had not anticipated its eventual enormity. The implications of IPv6 are equally enormous; the number of addresses it affords is staggering: 6.5X10 to the 23^{rd} power for every square meter of the planet. Once fully integrated, IPv6 will allow nearly limitless digital tagging (and tracking) of objects and by extension, of people. As Cerf notes, "the consequences of our lifestyle decisions will be more apparent to us" (0:33). But even as these lifestyle choices may become more apparent to some of us (those who are privy to the data that large systems nets), the invisibility of large technological systems proves problematic. There is a certain technological determinism that follows this abundance of IP addresses; it almost begs to have every sock, every water bottle, every shirt (and all of its buttons) tagged. This is the "web of things," which is sold as the brave new world of innovation, convenience and wonder, but it is also one that might ultimately prove quite oppressive.

On the other hand, copius tagging may help to highlight some of the otherwise neglected aspects of those lifestyle choices, forcing us to consider the detritus, the material in which the prominent stuff swims, with the suspicion that the agar that grows the culture is as important as the cultured cells themselves. A case in point: recent research found that glia cells, which make up 85% of the brain, engage in both chemical and electrical processes. Once considered merely gray goo, packing material for neurons, they are actually integral to brain processes. The persistent emphasis on the 15% of the brain comprised of neurons is at best incomplete and at worst, wrong. Rather than putting ubicomp to use for larger and more complex surveillance models whose goal is the discipline of society, we might consider a latent approach to enhance existing technologies. For instance, the sophisticated graphics of first person shooter games can be used for more complex synchronous interactivity in MMORGs and ARGs (Alternate Reality Games), given sufficient connectivity. By intentionally adopting an array of human-computer potentialities, these emergent forms can exploit networked graphics processing and tagging functions, while retaining the performative aspects of loosely structured play. When many players contribute to the game scenario, its messiness can become far more fruitful than the tightly scripted shooter games. And this can bridge the digital-material world in compelling ways that connect humans, often across their disparate material circumstances, rather than segregating them.

For example, at the University of Southern California, we recently deployed an ARG associated with a course that enrolled all incoming undergraduate students in the School of Cinematic Arts across its five divisions: interactive media, animation, screen writing, critical studies and production [http://reality.usc.edu/]. These students, who would normally remain mostly silo'd in their home divisions until at least their junior year, were given the opportunity for immediate collaboration among their cohort, as well as with alumni mentors. Students earned points by acquiring deal cards via geo-caching and producing projects according to their creative combinations. When put together, the cards offered creative constraints, as well as incentives for working in groups. And the 120 students produced more than 100 collaborative projects during the ARG's inaugural semester. Winning projects were chosen weekly and rewards were face to face events: outings with distinguished alumni like John Singleton, or seats for special screenings at the Directors' Guild Theatre in Hollywood—activities meant to build community and to offer students a fuller experience of their chosen field. Without grades attached, students were free to experiment with collaboration and media-making, within the structure of the School of Cinematic Arts. This approach does not deny the value of university curricula, but rather extends and enhances it. Too often the valorization of DIY and informal learning seems hopelessly impotent, issuing as it typically does, from institutional constituencies, with no apparent self-consciousness or sense of irony. Motivating



players does not have to be a complete replacement for more structured learning, even as it can inform curricula.

Asserting the value of play can help counter the atmosphere of efficiency and expediency that we have inherited from our algorithmic progeny.[xvii] Playing in multiuser spaces also mirrors the type of collaborative effort endemic to the networked world. Indeed the type of play associated with improvisation, though currently most closely linked to comedy, is actually rooted in an educational model meant to bring ethnically diverse children together around a shared goal.[xviii] Play is also an important though often neglected aspect of critical theory and cultural studies. In 1955, John Huzinga argued that play precedes culture since animals play. Therefore, any move toward post-humanism, or trans-humanism ought to reaffirm the value of play for experimentation and simulation, for collaboration and communication, and for the way that roles and avatars can help shatter the type of inflexible approach to identity inherent in institutionalized modes for tracking humans.

Future Past

Until quite recently, the predominant mode of computing has been data management, text mining, and the ability to crunch large number sets. It enabled accelerated forms of current epistemologies rather than generating new ways of knowing. Web 3.0 applications demand a rethinking of the boundaries of current epistemologies. It is not hyperbolic to maintain that we are, at the very least, on the cusp of a paradigm shift, as quantum computing, for example, anticipates things that have heretofore been impossible and largely unimaginable. We may not be able to anticipate the precise nature of emerging technologies; still, we can erect an ethical framework that guides the construction, and governs the uses to which globally linked infrastructures may be put. And these frameworks should never be devised by a single constituency, those with the same habits of thought, or those who are similar in their motivations, whether technologically sweet or economically expedient. Digitally networked technologies impact so many facets of daily existence that they require input from multiple vantage points: legal, environmental, philosophical, cultural, health, economic to name just a few, and not simply the technological.

Yet current academic disciplines, having coalesced during the ascendency of print, are seldom structurally amenable to massively multiple scholarly collaborations. By and large, things have remained the same as they ever were: the hard sciences rely on empiricism, while the humanities adopt critical approaches. Both methodologies are valuable and they can inform each other, because the complexity of these systems means that no single person or group will have the requisite talent or expertise to work alone. But expanded methodologies will be limiting unless also accompanied by expanded research questions. As Anne Balsamo so eloquently argues, contemporary culture has a vital need for the development and exercise of the technological imagination. And this exercise includes asking better questions because the scope and nature of the question demarcates the range of possible answers. With this in mind, we might ask whether current digital assemblages have erected an embarrassingly literal instantiation of poststructuralist theory (cf: Landow), and if so, whether this allows theorists to ignore the concerns of hard and software, seeing them as merely non-conceptual issues. Or might we consider the ways in which a more nuanced conception of how the immaterial begets the material (rather than the reverse) might productively complicate the inevitability of technological determinism on the one hand, and reign in the faith in the self-correcting nature of collective wisdom on the other.

Control is a common theme in efforts centered on the type of complex systems that characterize Web 3.0 as researchers ask which functions and processes can be controlled and which are beyond control. Endemic to control is the move to standardization. Indeed, this is the very heart of empiricism since control groups are the standard against which deviations can be measured. Indeed, Brian Massumi argues that the clinical mode "produces a backdrop of generality" since there is an assumption of comparison and statistics, by necessity, discard the exception (166). Philosophical thought, he continues, can "pry open" the loop that shuts out singularity. I would add that empirical singularity carries the same promise as the poststructuralist tendency to pursue that which is counter-intuitive, to defamiliarize accepted wisdom in order to better apprehend its constructed nature. From this angle, we might ask whether we are attempting to control the wrong things. Perhaps we ought to encourage the web to be looser and our thoughts to be more structured. The awareness of neuroplasticity and the impact of digital media on the brain can be a source of human empowerment.

Fueled by her struggle to recover from a major stroke, neurologist Julie Bolte Taylor argues that we must cultivate our brains with fierce intentionally in order to hone both hemispheres. She argues that, "without structure, censorship, or discipline our thoughts run rampant on automatic" and this lack of brain management renders us vulnerable to political manipulation, and allows us to be duped by advertising (152). By managing our thoughts however, and directing them with intentionality, we can actually shape them and determine our future thoughts. Mediation, for instance, which is a type of directed thought, becomes an area that far more scientists ought to pursue. Moreover, Catherine Malabou's work in this area is also inspiring. Too often, she contends, plasticity is conflated with flexibility. Tracing the etymology of the term, she notes that plasticity signifies the taking of form (like flexibility) but, more profoundly, plasticity also includes the imposition of a form; it is active rather than simply compliant. As such, she concludes, "[f]lexibility is plasticity minus its genius" (12). Malabou argues that rather than simply submitting to institutional structures that global capitalism imposes upon us, an awareness of the plastic nature of our brains can help us to "un make" what has gone wrong. And this is perhaps where the most salient difference between digital processors and brains shows most vividly: while computer files overwrite each other always leaving a trace, neural pathways actually remove previous connections as they make new ones. The eternally generative nature of organic systems like the brain might better be accessed organically, with algorithms created to aid them, not endeavoring to replace them.

NOTES

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[i] It is worth noting the problematic nature of the term Web 2.0 and, by extension, Web 3.0. Henry Jenkins argues that Web 2.0 is a business model, defined (if not hatched) by O'Reilly Media and, he argues, it must be distinguished from participatory culture. When it comes to cyberinfrastructure, however, the differences between business, academia and government are increasingly complicated because these efforts require the cooperation of disparate constituencies. W3C, a global board that attempts to guide such efforts has been integral in touting the semantic web.

[ii] I gave a very early version of this essay at the 2008 conference of the Society for Cinema and Media Studies.

[iii] Berners-Lee has said that he saw HTML as an in-house experiment and also maintains that his original proposal for the web < http://www.w3.org/History/1989/proposal.html> did include linking structures of the type now advanced by Semantic Web proponents. It is worth noting that his original proposal was considered "vague" by his manager, Mike Sendall. After revising with the help of Robert Cailliau, the proposal was accepted by Sendall.

[iv] See "The Semantic Web, Syllogism, and Worldview," http://www.shirky.com/writings/semantic_syllogism.html

[v] See, for instance, this study of Louis Van Aln's matching game: Thompson, Clive. "For Certain Tasks, the Cortex Still Beats the CPU," *Wired Magazine.* 15.07, online 25 Jun 07.

[vi] As the New York Times reported, and as many of us guessed by the sudden messages asking us to tag our Facebook friends, rolling out such features before announcing them has been a chronic Facebook move which has angered many. See:
2011/06/07/facebook-changes-privacy-settings-to-enable-facial-recognition/?smid=tw-nytimes&seid=auto
The Federal Trade Commission is now regulating Facebook's privacy options, having found that the company deceived its users. They recently mandated independent privacy audits every two years for the next twenty: http://www.pcmag.com/article2/0,2817,2396992,00.asp

[vii] "Imageworlds" is Ron Burnett's term for the contemporary landscape, which is so heavily visually mediated. But Burnett's use of the term is not confined to external images; rather he suggests that any viewing is necessarily wrapped up in memory and imagination. Thus the notion of passive viewing is untenable. I find this conception far more satisfying than those that distinguish interactive media, which is often simply a choice of navigation among finite linkages.

[viii] See the accompanying documentation of the smartphone brain scanner, "*Applying a Bayesian approach to reconstruct the neural sources we demonstrate the ability to distinguish*

among emotional responses reflected in different scalp potentials when viewing pleasant and unpleasant pictures compared to neutral content." http://milab.imm.dtu.dk/eeg

[ix] *Scientific American Mind* ("The Hidden Brain" R. Douglas Fields, May/June 2011) recently reported on the 85% of brain cells that most researchers have up till now ignored as mere packing material, but which seem to do far more work actually do far more work than that as they mediate neural pathways and use both chemical and electronic processes. Raymond Kurzweil believes blood cell sized computers to be eminent since the technologies we build will then help us invent the next generation of technologies. Thus, he argues, we are close to a moment of singularity, which will change everything. See *The Singularity is Near: When Humans Transcend Biology (*Penguin, 2006.)

[x] See *Parables for the Virtual*, page 24 for a more nuanced description of embodied emotion and affect.

[xi] Though there are many accounts of the phenomenon, several overviews of recent scholarship can be found in "All Smoke and Mirror Neurons?" 2009: http://mindhacks.com/2009/05/27/all-smoke-and-mirror-neurons/ and "Do Mirror Neurons Give us Empathy?" 2012 http://greatergood.berkeley.edu/article/item/do_mirror_neurons_give_empathy

[xii] See, for example, Gonzalo Frasca's "Ephemeral Games: Is It Barbaric to Design Video Games after Auschwitz?" (*CyberText Yearbook* 2000) and Miguel Sicart's *The Ethics of Computer Games* (MIT 2009) for some of the earliest and most comprehensive treatment of ethics in games studies.

[xiii] This effort follows a 2007 report issued by TRIAL, a Geneva based humanitarian organization. For an overview of the key issues, see this post in *Kotaku,* the prominent gamer blog: http://kotaku.com/5863817/

[xiv] A good overview amidst lots of recent press coverage in this article: http://owni.eu/2011/12/01/spyfiles-wikileaks-revelations-of-mass-internet-surveillance/

[xv] The *LA Times* reported this number on December 11, 2011 and the game's release was November 8, 2011, just over four weeks prior: http://latimesblogs.latimes.com/entertainmentnewsbuzz/2011/12/call-of-duty-modern-warfare-3-clocks-1-billion-dollars-in-sales.html

[xvi] This is another reminder that thinking and physicality are false binaries, a foundational notion for companies such as Neurosky [http://www.neurosky.com/].

[xvii] As Katherine Hayles argues, we make our tools and our tools make us; this is her concept of "contemporary technogenesis," a stance I find attractive in that it recognizes but is not enslaved by technological determinism.

[xviii] Improvisation was an integral part of Viola Spolin's theatre games, which were part of her educational framework for uniting multi-ethnic kids in 1930s Chicago schools. These

children usually did not speak the same language and their main interaction was street fighting. Improvisation allowed them to unite under a shared reality and a common goal and their roleplaying removed much of the obstacles born of ego. Spolin's son, Paul Sills, founded Second City, bringing his mother's techniques to comedy. For a great overview of Spolin's approach see Mike Bonifer's *GameChangers: Improvisation for Business in the Networked World* (2007).

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