

**Ontic Communities:
Speculative Fiction, Ontology, and the Digital Design Community**

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Abstract

Ontic Communities: Speculative Fiction, Ontology, and the Digital Design Community
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This dissertation is about the digital design community, those who build cultural and artistic works primarily using digital media. This dissertation, however, is also centered around a larger argument, of which the digital arts and design community serves as a case study. In short, the larger argument is a call to examine more closely the social relationships of material objects (including, but not limited to, humans and things) and idea objects (including, but not limited to, broad cultural and social forces) that constitute the world.

This dissertation forwards three major arguments:

- 1.) That it is often the case, particularly in the social sciences, that scholars look not at non-human objects, but instead at the ways those objects are perceived and labeled by humans/society. Scholars of materiality, then, often miss the mark, and study the *conceptualizations* of objects at the expense of the objects *in of themselves*.
- 2.) That it is theoretically and empirically possible to examine objects in of themselves, and that it is important to do so, as both material and non-material objects contain causal powers that impact history and society independent of the human recognition or conceptualization of these powers.
- 3.) That objects are also subjects, and engage in intersubjective meaning-making both with humans and other objects. Objects, then, should not be theorized as having various mechanical impacts upon human communities that they interact with, but should instead be theorized as members of the community in of themselves. Non-human entities, in other words, are themselves social beings.

Introduction

In the winter of 1995, science fiction literary agent and author John Brockman sat down to lunch with a division head of a new publishing company, a company that, like so many others, was attempting to ride the economic wave of "multimedia convergence" ushered in by the growing ubiquity of the World Wide Web. As the division head ran through a conversation concerning the massive efforts companies were making to "digitize assets," outsource "keystroke" workers, and find "content providers," Brockman came to a realization:

Something big was happening.¹

Brockman, who's publishing company had a long run of success in the 1980s by being one of the first to market itself to software developers during the initial personal computer boom, played the businessman. The new terms and ideas in this conversation convinced him that some sort of technological and economic change was on the horizon, and he wanted to position Brockman, Inc. to be on the forefront of the potential monetary windfall. To that end, Brockman set up a series of lunches and interviews with some of cyberculture's elite, whom he dubbed the "digerati," in order to help him paint a picture of what the present and future of a world inundated with digital technologies may be. He would later publish excerpts of 33 of these interviews in his book *Digerati: Encounters with the Cyber Elite*.

One of the digerati interviewed by Brockman was Jane Metcalfe, board member of the Electronic Frontier Foundation and cofounder of Wired Ventures, the publishing company of the then-wildly popular and sometimes controversial *Wired* magazine. When asked about the new digital world and *Wired's* place in it, Metcalfe responded:

It's trite to say that *Wired* is talking about the convergence of media, computers, and communications. What we are really talking about is a fundamental shift in

¹ Brockman, J. 1996. *Digerati: Encounters with the Cyber Elite*. Hardwired Books, San Francisco, CA

society that is being led by technology but is infiltrating every aspect of society. Technology, invented in labs, gets absorbed by business, and as business takes it on, it starts to spread throughout society. Often, at that point, artists are attracted to it and pioneer it, champion it, stretch it, push the boundaries of it, and use it to bring a different message to the public. It's a three-pronged approach that has a multilayered response from the society it's impacting. *Wired* is really about this change. It's led by technology, absorbed by business, and spread by artists. But it's not about technology.²

At first glance it would be easy to dismiss this quote as a bit of marketing. *Wired* has, throughout its history, aggressively tried to position itself as a magazine focused on design, culture, and society, and not a technology or product review journal. While there may be some validity to this, this quote also begins to unearth valuable areas of exploration for examining the process of creation and actualization of digital technology. What is embedded in Metcalfe's "three-pronged approach?"

There are several places where Metcalfe is unclear. The first thing Metcalfe identifies as a driving factor in the digital age is the technology itself. Is she a technological determinist? The technology starts the revolution, gets absorbed by businesses and artists, and seems to direct the evolution of culture. At the very least, Metcalfe appears to be discussing attributes or applying causality or agency to technology itself. Has Metcalfe just been swept up in what Brian Cantwell Smith³ and David Hakken⁴ bemoan as the unfortunate and problematic ontological speak which ensnares the disciplines of computer science and engineering?

Of course, Metcalfe acknowledges that this technology did not come from alien or natural forces. It was created, presumably by humans, in a laboratory. This human-constructed technology then becomes adapted and its uses reconfigured by businesses and the arts. Metcalfe could be describing the creation process of the Internet--a military-funded research

² Brockman, J. 1996. *Cyberculture: Conversations with the Digital Elite*. Hardwired Books, San Francisco, CA. pp. 221

³ Cantwell Smith, B. 1996. *On the Origin of Objects*

⁴ Hakken, D. 2003. *The Knowledge Landscapes of Science*. Routledge, New York, NY

project advanced by DARPA in the late 1960s, which would become popularized via universities and commercial companies in the late 1980s, and adopted and adapted by artists and users beginning in the 1990s, notably by Usenet groups in Metcalfe's time. Or she could be referring to the influence of the Xerox PARC laboratories for ubiquitous computing, as chronicled by Paul Dourish and Genevieve Bell.⁵

What Metcalfe doesn't address is the identity of these laboratory operators. Who were those that drove the creation of these technologies and, perhaps just as important, what drives the drivers? Dourish and Bell paint the paradigm case of teams of computer engineers in PARC laboratories inspired by the professional writings of computer scientist Mark Weiser. In this community, several groups of computer engineers, all highly trained and working together in corporate or government laboratories, share a common vision of the future of ubiquitous computing, largely because of papers and ideas presented at professional associations and conferences. But how do we compare this environment and this creation process with something like Linux? Linux, an operating system that began with Linus Torvalds tinkering around with a personal project on his university PC, is now a free and common operating system used in professional graphic design, server nodes, and home computing. The Linux kernel continues to be developed by professional companies and indie hackers in basements, and is one of the foundational communities of the open source movement. What about Steve Jobs and Wozniack, who developed the Apple computer hardware in their spare time in a suburban garage? Can such wildly disparate practices of creation truly belong to the same discipline or community?

Metcalfe's second and third prongs can be addressed here together--the role of business and art for distributing and extending technology. While separating research

⁵ Dourish, P. and Bell, G. 2011. *Divining a Digital Future: Mess and Mythology in Ubiquitous Computing*. MIT Press, Cambridge, MA.

laboratories and business interests is inherently problematic, we can assume that Metcalfe is speaking about the dotcom boomers of the 1990s--entrepreneurs and independent investors who see a new commercial use for technology and markets it to the public. The notion of "artists" is a little more vague. Is Metcalfe referring to design artists, like web graphics developers and computer animators like Denis Muren, the special effects supervisor on films like *Star Wars: A New Hope*, *Terminator 2*, and *The Abyss*? Is she referring to artistic thinkers who largely deal with visual and computing media, like Scott McCloud, author of *Reinventing Comics*, and Ian Bogost, Joint Professor in Interactive Computing at Georgia Institute of Technology and creator of the psuedo-game Cow Clicker? Or is she talking about people like Ted Nelson, "digital Maoists"⁶ that praise the collective production possible via the web and network technology? In any case, these artists and businessmen are presented as separate from the community that designs technology, although they play an important part in proliferating new technology to society.

Again, we don't have to accept Metcalfe's assertions as true to recognize the interesting theoretical questions they stir. Are businesspersons and artists truly in a separate community from the designers of technology? For that matter, how far does the design community reach into society at large, and influence the "multifaceted response" of which Metcalfe speaks? Perhaps in a world where digital creation technologies are so ubiquitous and digital literacy so profound, that, as Clay Shirky would advocate, we are moving towards a society where the word "designer" no longer has any meaning, as everyone is now a creative, and therefore is a designer.⁷

⁶ Kelty, C. 2005. "Geeks, Social Imaginaries, and Recursive Publics." *Cultural Anthropology* 20, no. 2 (2005): 185-214

⁷ Shirky, C. 2008. *Here Comes Everybody: The Power of Organizing Without Organizations*. Penguin Books

Finally, we can question the linear process of design and development that Metcalfe unfolds for us here. The system proposed begins at the lab and ends at society. Of course, as any human factors researcher will tell you, technology developers often incorporate social research into their designs, and people at large tend to use technology in both expected and unexpected ways. They may find new uses for a device or service, and always reevaluate and renegotiate the meaning and cultural context of their devices. Cell phones were not envisioned as fashion markers. Email was not designed to have spam.

But how do we understand technological developments that seem to fold back in on the design community? Technologies or works of art that, once created, have both expected and unexpected impacts on the developers themselves? Consider Douglas Caldwell, who sees a not yet existent three-dimensional topographical display device depicted in the 2000 film *X-Men*, and goes back to his day job in the Army Corps of Engineers and develops the Xenotran Mark II Dynamic Sand Table, an almost one-to-one recreation of the apparatus shown in the film.⁸ Should John Myhre, the production designer and art director for *X-Men*, get partial credit as a co-author of the Mark II? Where did the science fiction end and the creation process begin? Who is the knowledge producer, the systems expert, in this relationship?⁹

What is This Dissertation About?

This dissertation is going to question axioms that are held by a great many social scientists and humanists. The point of doing so is to further a theoretical framework, which itself has origins in posthumanism and speculative philosophy, which I believe will better enable social scientists to understand and analyze the production of creative work, the relationship

⁸ Shedroff, N. and Noessel, C. 2012. *Make it So: Interaction Design Lessons from Science Fiction*. Rosenfeld Media

⁹ Knorr Cetina, K. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press

among computers, humans, and other selves, and the network of causality that impacts living things, machines, and ideas.

In essence, this dissertation is going to argue the following points: That digital artists and designers, despite the varied types of art that they produce, are a unified Community of Practice. That the "sites" of the digital design Community of Practice are located in studios, at conferences, at personal computers in a home, and in magazines and pop culture. That digital designers talk ontologically, and that there is an objectively real world with which designers interact. That the objectively real world contains living things, material objects, and ideas, and that all these inhabitants of the world have casual effects upon one another. Finally, that certain technologies and certain ideas, in addition to beings a part of the causal network of digital design, can also be community members, "selves" that participate in the negotiation of meaning alongside humans.

In short, this dissertation is about designers, the community of practice of which they are a part, and who or what makes up that community. This work further explores the cultural influences on the discourse of this community that range from politics to science fiction. It will also depart from and take issue with the radical social constructivist¹⁰ approach often found in Science and Technology Studies, which focuses on epistemological issues that ask *how do we know*; it will instead follow something of an ontological turn that examines ontic talk, which is more about what things there are and their properties. It is important to note that I do not reject epistemological questions, which focus on knowledge and how we know the world. These questions are of great importance. They are not, however, all there is to study.

More particularly, this dissertation focuses on the discourse that occurs within the design community at large. That focus precluded the ethnographic or ethnomethodological foci

¹⁰ Hess, D. 1997. *Science Studies: An Advanced Introduction*. NYU Press

on specific laboratories and studios performed by scholars like Karin Knorr-Cetina, Lucy Suchmann, and Paul Dourish and Genevieve Bell. Ethnography provides valuable insight into the everyday “workplace” practices in design. However, in order to get a sense of a wide range of discourse, it was important to obtain more general data than an ethnography provides, such as counts of argument types and word choices over a long period of time. This research also demands a wider population sample than ethnography traditionally deals with.

As noted, the content analysis, which forms the backbone of the research, breaks from the STS-style ethnographic lab studies research discussed earlier. In effect, content analysis reveals less about the day-to-day goings on of the design world and more about the overall theoretical and cultural influences and viewpoints of digital design, and provides a long-term view of the changes and shifts in the digital design community over a 20 year period. The discourse that occurs in the analysis tends to focus on the nature and purpose of design and technology, and not just on the practical “how tos” we would expect to find in a laboratory setting. In other words, design talk in the content analysis makes causal claims about the properties of the technology used and created, the place of technology in the social and natural world, and humanity’s role in this new world. This discourse is firmly ontological. By opening up the analytical lens of designers beyond the lab or studio, the content analysis also serves to complicate our notions of the identity and role of designers as a community.

The deep hang-outs serve to contextualize the findings in the content analysis, and provide an analytical richness not easily extracted from the pages of a magazine. Nothing can replace the real-world experience of the discussions of possible sex and roleplay on *Star Trek: The Next Generation’s* holodeck that take place over falafel and soda at a games studio. These semi-ethnographic experiences also reinforce the sense of unified diversity within the digital design community gleaned from the content analysis that will become strongly evident later in

the dissertation. My travels included an open-invitation neighborhood games studio and a \$1000-per-ticket transnational animation and technology conference. Both groups considered the other to be parts of the same whole.

Essentially, this dissertation conducts a content and discourse analysis of the 20 year run of *Wired* magazine, supplemented with "deep hang outs"¹¹ at various conventions, meetings, and studios, including SIGGRAPH and Cipher Prime. In addition, this research was augmented with designer interviews, quotes and stories taken from documentaries, popular articles, and design classrooms, and my own experiences over a decade as a digital designer.

Wired Magazine

Wired magazine was first published in January of 1993, founded by unabashed technopians Stewart Brand and Kevin Kelly, whose goal was to tap into the growing pop scene surrounding computers and network technology. Hailing Marshall McLuhan as their "patron saint," *Wired* magazine's goal was to document the "digital revolution," or the way that the new technological scene was going to revolutionize human culture and politics. As such, articles tend to focus on the potential social and political impacts of technology as opposed to technical specs, and *Wired* interviews tend to highlight "techno-visionaries"—designers, engineers, and authors who envision technological impact on a grand scale, such as science fiction author William Gibson, computer scientist and Sun Microsystems cofounder Bill Joy, and legal scholar and academic Lawrence Lessig. Today, *Wired* publishes the magazine both in print and via tablet and the web, and is also responsible for *Wired News*, a network of blogs written by tech critics and pop thinkers that expand upon articles and ideas found in the magazine.

Few would question *Wired's* influence in geek culture, particularly in its early days. In addition to many major practitioners and theorists contributing to the magazine, *Wired* has

¹¹ Geertz, C. 1998. [Deep Hanging Out](#)

coined several phrases or terms that have become prevalent throughout the digital media, such as the concept of the “Long Tail”—selling a wide variety of goods to a wide variety of customers, or, the reason Amazon.com is a success—and “crowdsourcing,” or using aggregate opinions of a large group of people to make design and business decisions. In many ways, *Wired* is a peerless magazine. It connects with the breadth of the designer community in a way no other more specialized or technical magazines do. Many, however, may not consider *Wired* to be a part of the design community itself. Because of *Wired's* status as a popular magazine, it is certainly legitimate to call into question the value of *Wired* in representing designer discourse. In the next chapter, I will argue that not only does *Wired* provide an excellent cross-sampling of the diverse discourse of the digital tech community, but that *Wired* itself is a member of the digital design community of practice.

SIGGRAPH

The Special Interest Group on GRAPHics and interactive techniques, or SIGGRAPH, is an annual conference that hosts thousands of designers, technicians, artists, and businesspersons for a week to explore new technologies, experience the cutting edge in animation and graphics design, and attend classes and discussions about the current state and future of digital design. Since its first meeting in 1974, SIGGRAPH has served as the launching pad for new technical ventures, artistic projects, and technical demos, including Pixar’s first animated short, *Luxo Jr.*, and the later *Tin Toy*, which would become the technical and artistic inspiration for the *Toy Story* series. In addition to these larger studios, individual artists and students are encouraged to submit work for review and critique, providing both valuable feedback from the designer community as well as networking opportunities. SIGGRAPH supports student chapters in over 50 universities across the world.

SIGGRAPH hosts a series of speakers and panel discussions drawing from producers and thinkers from varied disciplines. The yearly keynote speakers—an anticipated event by attendees—generally features one to four practitioners who have either had great influence in shaping the history of digital media or are viewed as pioneers in the field. Previous keynotes include Cory Doctorow, Jane McGonigal, Wil Wright, and George Lucas.

In addition to tech demos and art exhibitions, SIGGRAPH includes peer-reviewed paper presentations—over 25,000 articles are stored in SIGGRAPH’s conference database. While a sizeable portion of these papers are technical in scope, many address more social and philosophical aspects of digital technology, such as gaming’s place in the classroom and the social contexts of digital artists in pop culture. The SIGGRAPH 2013 conference took place in Anaheim, CA.

Cipher Prime

Cipher Prime is an indie game studio located in Philadelphia. They opened their doors in 2009, and as of 2013 have published four games with another forthcoming release. Like most indie studios, Cipher Prime's development staff is small compared to major game development houses—generally about five people. Their games are featured on multiple platforms, from the PC to iOS systems to the Playstation 3, and are often available on the popular digital distribution service Steam.

What makes Cipher Prime unique is their prominent place in the Philadelphia gaming community. Every Thursday night, Cipher Prime hosts "Dev Night," where they open up their studio to any interested persons who want to hang out, talk shop, play games, or compete against each other in *Starcraft II*. Attendees are mostly young male game developers, and include students, amateurs, and one-person professional “studios.” One Thursday a month, Dev Night features a Game Jam, where one or two-person teams have twelve hours, from 6 PM to 6

AM the next morning, to develop a game from scratch. The entries are then judged at the next week's Dev Night, with the winners receiving highly coveted bragging rights.

Myself

I've been interested in the impact of pop culture and the outside world on the design of technology since I was an undergraduate design student in the mid 2000s at Drexel University's Digital Media Program. While most of the examples and data used in this book will come from the aforementioned sources, some insights will be derived from my decade of experience in the design industry. I have worked as a game and interface designer for Comcast, one of the largest communications companies in the US, developed 3D and web historical recreation assets on New Jersey government grants, consulted for startups, and freelanced as a web designer. I have also had the fortune making close friends with many members of the digital design community through my research, learning, and teaching experiences.

Methods

The content analysis was operationalized as the content of *Wired* magazine over its entire run. The unit of analysis was an individual item of text, i.e., the individual story. Over this 20 year period the organization of content and its formatting changes significantly. While article length and style remain similar, *Wired* itself has gone through many changes in the past 20 years that have impacted its layout. *Wired* began as a small, "voice of the underground" style zine, and is now a major publication owned by Condé Nast, part of the publishing magnate which also owns *GQ*, *Vanity Fair*, and *The New Yorker*, among others. *Wired* later began to incorporate its web presence into the magazine, with many articles appearing both in print and online, and with sections like Rants and Raves, their letters to the Editor, transitioning from multi-paragraph responses to 140 character Tweets. The discursive elements I coded, however, remained relatively consistent throughout the corpus.

As *Wired* publishes monthly and contains over 150 pages per issue, a complete analysis of every issue and article was impractical. I devised a sampling scheme that randomly sampled from the 240 published issues of *Wired* that span from 1993 to the end of 2012. My sampling schema had to account for the change in article content and format over time, as well as the different types of article content within each issue. Thus, a simple random sample of all articles from my *corpus* would not suffice. For this reason, a multi-staged stratified sample was used. Two issues from every volume of *Wired* were selected. From each of these issues, a random sample of nine articles was coded. This sample gave me a total of 360 articles, all evenly spread over the timespan of my *corpus*.

My coding schema consisted of *a priori* codes that were meant to identify speaker, the type of design or product that was being discussed, and whether or not the discussion included references to design practice, properties of technology, talk of identity, and various themes. In addition, *a posteriori* codes were collected that traced specific references to technology, themes, and pop culture. Whenever a pop cultural, political, or These codes served as a guide for a discourse analysis of *Wired*, which allowed me to examine emerging themes over time within the corpus, and the compositional, rhetorical mechanisms operative in a piece in a way content analysis could not. These codes were then tested for reliability.

My semi-ethnographic experiences took place for three months in the Summer of 2013 at Cipher Prime and for the weeklong duration of SIGGRAPH 2013 at the end of July 2013. My interactions with these groups ranged from attending Q and A panels to group conversations, though I never conducted any formalized interviews. My role as a researcher was always clearly stated, and the spaces I interacted within were always open invitation to the public, with the exception of SIGGRAPH, which had open ticket purchases.

Design Communities: Who--or What--Comprises them?

Who is in the design world, and how do we begin to describe it? In the 1970s, before the breakout age of the personal computer and the subsequent rise of the net, it would have been simple enough to limit those who work in digital technology to computer engineers, whether they worked in hardware or software (and who usually had to work in both), and to conceptualize their natural habitat as the laboratory. Things, obviously, have changed. In the contemporary world, digital design includes a wide variety of activity--from web design to 3D art and animation, photography, computer hardware engineering, and game design. And these are just the "traditional" occupations associated with digital technology--the scope of the field has expanded. SIGGRAPH, for example, had several presentations given by biologists and medical experts on their work, which they consider design work. Digital technology chronicles and modifies the human genome, and mass-produces organic material to aid in human organ transplants. Most of the work done in this discipline occurs in the digital space of the computer screen, and would not be possible without computing technology. Is biology design?

Can we even begin to talk about these disparate disciplines as a unified group? Designers are located in a large array of places: Hollywood, corporations, universities, and basements and garages. In the following chapters, I will argue that in order to understand digital design, we must acknowledge that these varied arts and sciences are in fact a unified Community of Practice. In fact, I will show that these groups already conceptualize themselves as a unified community.

What makes designers a community of practice? At first glance, they appear to be a technically minded field, particularly those who build computer hardware. In this case, designers would seem to have much in common with scientists and engineers, who are a primary focus of Science and Technology Studies and laboratory studies. STS scholars, who do not use the term "Communities of Practice," would conceptualize the design community as a

"knowledge community." Sociologists and anthropologists may be familiar with knowledge communities through Karin Knorr Cetina's *Epistemic Cultures*¹², which examined the different ways of knowing across the natural sciences. Here, Knorr Cetina argues we can conceptualize these experts communities as epistemic cultures, or knowledge workers united by shared norms and techniques of knowledge. A fuller definition is given by Hjørland and Nicolaisen, where "epistemic culture refers to the practices and beliefs that constitute a culture's attitude toward knowledge and its way of justifying knowledge claims."¹³

For Knorr Cetina and others like Bruno Latour, scientific and technical work can be understood through the culture of the individual discipline of the lab. Theoretical physicists, for example, are less concerned with empirical experimentation than with mathematical proofs, whereas the main work of biologists is empirical in nature, generally involving tightly regimented tests of controls and variables, particularly in fields like medicine. These basic understandings of the way science should be conducted change the types of questions asked by the two fields, and thereby change the practice that occurs and the knowledge and creations generated by these questions.

As a community, digital designers certainly are in part an epistemic culture in the above sense. Specific technical disciplines, such as game design or web graphics, each have their own set of understood areas of investigation. Game design programmers, for example, will generally be more concerned with the amount of processing power each system process in their game requires from the user's computer, since running a game takes an enormous amount of computing resources. Web sites, in contrast, are light on processing power requirements, and as such, contemporary web graphics artists are rarely concerned with the hardware

¹² Knorr Cetina, K. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press

¹³ Hjørland, B. and Nicolaisen, J. (2006). "Epistemic Culture." From *The Epistemological Lifeboat: Epistemology and Philosophy of Science for Information Students*.

configurations of their users beyond screen size. Practical techniques developed also change from discipline to discipline, such as game developers creating tools and algorithms that may easily compute trigonometric bounces of light, and web graphics artists creating disciplinary standards for easily-readable typographic elements.

However, there are elements of the digital design community that the concept of epistemic cultures cannot fully capture. Primarily, as we will see, the digital design community is much less focused on issues of *how they* know the world, and instead focused on *what is the world, and what are the world's properties*. In addition, Knorr Cetina notes that a major theoretical finding of her work is exposing the *disunification* of the sciences; that is, that individual scientific fields rely on very different axiomatic constructions of the world¹⁴. This finding is opposed to the unity of science movement, which claims that all natural sciences are inherently linked because of their pursuit of objective truth and the use of the scientific method. As this dissertation will present, not only do seemingly disparate design foci see themselves as a united community, but they in fact often try to incorporate elements of one technical field into another. Designers on sites like Newgrounds.com create videogames specifically tailored to be experienced within a web browser. Massively multiplayer online games like *Final Fantasy XIV* pull in the opposite direction, and bring into console gaming message boards, email clients, and friends lists--elements that used to be exclusively associated with web browsing.

In addition, design communities, as noted above, are not just native to laboratories, and the participants in these communities are not always vetted by advanced training or education. While laboratory studies and the notion of epistemic cultures is certainly useful because of the technical focus found in digital design, this body of literature is too limiting. As opposed to a laboratory or studio culture, it is more accurate to describe the design community as a diverse

¹⁴ Knorr Cetina, K. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press

group of agents who are oriented around the practical functions of the technology they commonly use and develop. While I will utilize and return to laboratory studies and epistemic cultures in a moment, I will argue in Chapter 1 that perhaps the best way of understanding digital designers as a community is to think of them as a Community of Practice.

The term Communities of Practice (CoPs), first coined by anthropologists Jean Lave and Etienne Wenger, describes the situated learning and negotiation of meaning that occurs within groups of practitioners.¹⁵ Wenger describes CoPs as distinct from interest groups or speech communities: "Communities of Practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly."¹⁶ As such, a neighborhood or gossip blog may not be considered a CoP, as the inhabitants of such groups may not be primarily concerned with matters of practical learning or the refinement of skills. Conversely, an academic conference or tutorials swapped by design students during late night meals better fit the definition provided by Wenger.

It is also important to note, as Wenger does, that the situated learning that takes place within CoPs need not be self-conscious. While conference attendees may actively seek to forge professional connections and find further sources of data and literature, the situated learning that takes place for students in computer labs the night before an assignment is due may be something less overt. On first impression, digital designers seem to form a community of practice because they hold networking and tutorial conferences such as SIGGRAPH, participate actively on post-and-critique websites such as the Animation World Network, and generally

15. Lave, J. and Wenger, E. 1999. *Situated Learning: Legitimate Peripheral Participation (Learning in Doing: Social, Cognitive and Computational Perspectives)*. Cambridge University Press

¹⁶ Wenger, E. "Communities of Practice." <http://www.ewenger.com/theory/>, accessed on Jan. 14, 2013

work and learn in studio settings, where classmates and fellow artists collaborate on projects and share advice and know-how.¹⁷

Communities of Practice research often focuses on epistemological questions--ones that examine either knowledge production, such as the scientific discoveries made in research groups, or question of "how we know" or "how we learn," such as the passing of existing information from a teacher to a student.¹⁸ This focus comes from the constructivist influences of CoP theory, which view the production of group knowledge as a kind of intersubjective meaning-making, or making sense of the world.¹⁹ This production of meaning is key for the way communities perceive and experience the world. Wenger himself, even while defending the practicality or success of applying CoP research to business and education settings notes, "Still, in the end, it is the meanings we produce that matter."²⁰

An issue, though, is that Wegner and other CoP authors tend to give fuzzy definitions of the meaning of "meaning." Wenger's dominant tendency, following this constructivist approach, is to talk less about the ontological nature of things and more about how community members think about these things. This epistemic fixation manifests itself in the way Wenger talks about reification, the act of "making sense" of the world through practice, and the production of meaning through the participation in communities of practice and through the grounding of abstract concepts.

For Wenger, reification is the process of making our everyday actions meaningful by constantly renegotiating our individual ideas and conceptions with new experiences the world

¹⁷ <http://www.awn.com/>

¹⁸ Suthers, D. 2006. Technology Affordances for Intersubjective Meaning-making: A Research Agenda for CSCL. *International Journal of Computer Supported Collaborative Learning*.

¹⁹ *ibid.*

²⁰ Wenger, E. (1998). *Communities of practice, learning, meaning, and identity*. (1st ed. ed.). Cambridge Univ Pr.

offers us. Wenger gives the example of a claims processor he calls Ariel. Ariel has an understanding of how the typical claims form looks and the way to process it. However, when problems or new cases emerge, Ariel must reconcile her abstract ideas of the claims process with this new individual reality.²¹ She “congeals” the abstract with the concrete, and in doing so amends her expectations of claims forms while at the same time situating this new type of issue or form within her larger expectations. Here CoP research echoes Berger and Luckmann’s thesis²² that all reality is a social negotiation between individual expectations and social contexts. When multiple people share in the act of building and negotiating these expectations and contexts, an intersubjective learning community is formed.

In a CoP understanding, this construction of meaning is primarily resolved through repeated tasks and practices. Often, Communities of Practice research is conducted using classrooms or workplaces as the subject spaces. For example, Florian Kohlbacher and Kazuo Mukai²³ examine working communities within Japanese divisions of HP computers, and paint a picture largely dominated by discourse related to practical information exchange among tech support groups and office workers. These research settings serve to calcify the boundaries of the Community of Practice. Either you're in the office building, and therefore part of the community, or you're not.

Laboratory studies and Communities of Practice studies are fundamentally linked via their constructivist leanings and their disposition towards ethnographic fieldwork. Both look at knowledge and meaning construction, and have a particular focus on a specific locale, be it the

²¹ Wenger, E. (1998). *Communities of practice, learning, meaning, and identity*. (1st ed. ed.). Cambridge Univ Pr.

²² Berger, Peter L. and Luckmann, Thomas. (1967). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Anchor Publishing

²³ Kohlbacher, F. and Mukai, K. (2007) *Japan's learning communities in Hewlett-Packard Consulting and ntegration: Challenging one-size fits all solutions*. Learning Organization, The, Vol. 14 Iss: 1, pp.8

laboratory, they office, or the online workgroup. Both lean towards ethnomethodological approaches for understanding community practice, and their data often takes the form of interviews and sequences of human events. Each of these studies focus on their respective communities as centers of knowledge, and tend to ask epistemologically oriented questions. The major theoretical distinction between work like Wenger's and work like Knorr Cetina's is that science studies very consciously focuses on experts systems--areas and communities where participation is vetted by high levels of training, knowledge, and expertise. Communities of Practice research does not necessarily focus only on experts.

Through the study of digital designers, this dissertation will explore the areas that these literatures tend *not to talk about*.

Communities of Practice and Science Studies literatures each have a tendency to focus more on a description of the community they are examining, as opposed to an explanation of what properties separate their community of study from wider communities. They rarely address, in other words, questions of *who is in* and *who is out*.²⁴ As noted by James Paul Gee, the term "community" suggests some form of warmth or togetherness amongst a group of people, or at the very least a sort of practical homogeneity. Coming from an education perspective, Gee opines that classrooms of students, which would be considered a Community of Practice, are rarely warm and fuzzy communitarian locales, and often contain elements of hostility or resistance, either between the teacher and the students, or among the students themselves. Gee also calls attention to the varied forms of student practice within a classroom--if one student is highly engaged and enthusiastic about the material, and another is just trying

²⁴Gee, J.P. 2005. *Semiotic Social Spaces and Affinity Spaces: From The Age of Mythology to Today's Schools*. In D. Barton & K. Tusting (Eds.), *Beyond communities of practice: Language, power and social context* (pp. 214–232). Cambridge University Press

to put forth the minimum amount of effort to pass, are they performing the same sort of practice? Are they, in fact, not within the same community?

Gee attempts to solve this problem by refocusing on the spaces people inhabit, rather than by relying on abstract notions of community in order to define groups. Rather than examine the things in common that students in a particular classroom do, we can examine the classroom itself as an "affinity space"²⁵, or a specific locale within which related human activity takes place. For Gee, this solves the problem of resolving the multiple types of activity that take place within a group of people, as the space becomes the unit of measurement, not the community. The use of affinity spaces also creates clear lines of demarcation for study--the authors of a textbook clearly have influence within the classroom, but need not be heavily considered since they don't reside in the classroom space itself.

The focus on "space and place" brought to Communities of Practice theory by Gee has been a major component of Science Studies for some time. There is a reason that Latour and Woolgar's foundational text is titled "Laboratory Life" and not "Communities of Scientists"--though an ethnographic work, the boundaries of the scientists studied are defined by those who work at the Salk Institute for Biological Studies in La Jolla, California.

One theoretical gap that I hope to address, then, occurs because of this methodological focus on spaces. When subjects are determined by their presence within a given area, researchers need no longer concern themselves with issues of *who's in* and *who's out*. The space and those within it do that work themselves. The theoretical focus then becomes description--how can we describe those who are there, their practices, and their ideas?

This type of description is valuable, and works well enough for groups whose spaces are relatively homogenous. Communities of Practice research very often examines offices,

²⁵ Ibid.

businesses, and educational environments--heavily structured locations whose equipment and organizations have relatively little variation. Observations of behavior made at one office park or one university can often be similarly observed at other offices and universities.

Knorr Cetina helpfully complicates the nature of her spaces of analysis--laboratories--by defining them as spaces that "provide an 'enhanced' environment that 'improves upon' natural orders in relation to social orders."²⁶ Laboratories, in other words, can range from classical notions of rooms filled with equipment and of men wearing white coats to the one-way mirror room of a marketing researcher to the psychoanalyst's armchair. However, it may be telling that Knorr Cetina chooses to focus her studies on high-energy physics and molecular biology labs, two locales that would be readily accepted as laboratories in the most romantic sense. Choosing spaces that are likely to be populated with what are traditionally considered scientists and knowledge workers affords Knorr Cetina the luxury of not having to defend what constitutes the science community.

So, despite Knorr Cetina's valuable observations of the possible heterogeneity of laboratories, both Communities of Practice and Science Studies primarily focus on spaces that have much more in common rather than less in common with one another. Again, this assumption of commonality of spaces is not valid in the digital design world. This leaves us back where we started, using the term "community" as the identifier of designers. If this is the case, it is critical to address who is and isn't a part of this community. The digital design world as a whole exceeds any single kind of space.

As the next chapter will show in greater detail, we can use *in situ* design discourse to inform who, exactly, makes up the design community. We can, however, consider a few examples here.

²⁶ Knorr Cetina, K. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press pg. 26

The Life of Pi, a 2012 film directed by Ang Lee, tells the story of a 16-year old Indian boy named Pi stranded on a life boat with a Bengal tiger. The Bengal tiger, one of the main characters in the film, is a completely computer-generated (CGI) character, and is technically and artistically profound. The film would not have been nearly as successful as it was without the CGI and special effects teams who created a realistic world and believable characters.

The film was a critical and commercial success, grossing over \$600 million, and was awarded the Oscar for Best Visual Effects. However, a week before the Oscars, Rythm and Hues, the company responsible for all the CG effects needed to tell *Pi's* story, had to file for bankruptcy. The visual effects (VFX) community was irate that the company largely responsible for the huge financial success of the film was given no substantial percentage of the film's profits. Over 500 VFX artists protested outside the Oscars, and when Bill Westenhofer, the VFX supervisor who accepted *Pi's* Visual Effects Oscar, mentioned Rythm and Hues in his acceptance speech, his microphone was cut off.

Outraged, members of the VFZ industry formed VFX Solidarity International (VFXSI), a 3D modeling and animation worker's rights group. VFXSI lobbies for financial reform in the VFX industry via social media, press releases, and demonstrations. However, VFXSI did not limit their efforts to just the animation community. When The Walt Disney Company gutted one of their subsidiary video game production studios, LucasArts, and fired all of the game programmers and artists there, VFXSI responded with the following statement on Facebook:

Everyone, in the light of the closing of LucasArts and others suffering within our fellow gaming community--I would like to make a call out to all of you who haven't joined us here yet to come join the movement. We also stand with you. We are all digital professionals. We all share in the same process and skills sets. VFXSI's mission is also here for the digital arts community as a whole. So please pass this on to all your friends, colleagues, relatives, organizations like the

IDGA²⁷, and companies who are also seeing the same crisis hit home. Come join us. We welcome all of you in making this voice stronger.²⁸

While obviously VFXSI had some political power to gain by diversifying their potential membership, they reveal a fairly common attitude within the digital design community--those that do are in. Rather than occupying certain spaces or having certain education, designers consider others to be designers when they believe they have a shared skills set, even if those designers are in a different discipline. Here, visual effects workers in Hollywood and game programmers in San Francisco, the headquarters of LucasArts, consider themselves to be a part of the same design arts community. As I will discuss in the following chapters, this skills-based sense of community is intriguing. While it's true that game developers and VFX artists have some overlapping expertise, there are also tremendous technological and practical differences between the two fields.

VFXSI explicitly states that they cater their message towards digital arts professionals. This is a disposition which is not always shared within the digital design community, which tends to blur lines between professional and amateur developers. In *Wired's* December 2006 issue, writer Bob Garfield discusses YouTube as a community of creators:

A recent Accenture study of 1,600 Americans found that 38 percent of respondents wanted to create or share content online. Aha! Suddenly the inexplicable "Numa Numa"²⁹ begins to make sense. He could, so he did. And so have lots like him. It's said that if you put a million monkeys at a million typewriters, eventually you will get the works of William Shakespeare. When you put together a million humans, a million camcorders, and a million computers, what you get is YouTube.

And there they are, in the bedrooms and dorms and cubicles of the world, uploading their asses off, more than 65,000 times a day on YouTube alone.

²⁷ International Game Developers Association, a non-profit association that serves as a worker's rights and mentoring group for professionals and students in the game development industry.

²⁸ VFX Solidarity International's Facebook Page, accessed April 3, 2013

²⁹ A video created by Gary Brolsma, a New Jersey amateur videographer. In the video, Brolsma lip dubs "Dragostea din tei," a song by O-Zone, a Moldovan pop group (<http://www.youtube.com/watch?v=60og9gwKk1o>)

"If you aren't posting, you don't exist," says Rishad Tobaccowala, CEO of Denuo, a new media consultancy. "People say, 'I post, therefore I am.'"³⁰

Should theorists count YouTube uploaders among digital designers? They appear to be engaging in a creation process, and using related skills sets to VFX, game, and web developers, which would match the criteria outline by VFXSI. The quality of YouTube videos ranges from terrible to professional; should there be a standard of quality that demarcates one as a designer, as opposed to a user? If we, or the design community, democratizes the term "designer" too much, does it become useless?

Design discourse also forces us to reconsider not only *who* is part of the Community of Practice, but, quite possibly, *what* is part of the community. Are the objects of design--the computers, the code--tools, or are they rather co-participants in a community? When Metcalfe uses words like "stretch," "push," "abuse," and "change," she is describing a process of discovery where artists encounter an object in the world, learn its properties, and then use or extend these properties for creative purposes. While Communities of Practice and Science Studies literature focuses largely on epistemic and practical "how to" discourse, I will show that design discourse often talks about the properties of the objects they interact with and create, the affordances of these objects that allow or prevent them from performing certain tasks, and the unintended emergent properties that arise from introducing a new technology or artifact into the world.³¹ Digital designer discourse, then, is largely ontological.

Ontology and Epistemology

³⁰ Garfield, B. 2006. The YouTube Effect. Featured in the December 2006 issue of *Wired*

³¹ Gibson, J. 1977. "The Theory of Affordances". In *Perceiving, Acting, and Knowing*, edited by Robert Shaw and John Bransford

On April 5, 2013, Gina Neff gave a colloquium presentation to my faculty and graduate student peers at Drexel University based upon her book *Venture Labor*. Her talk focused on working and risk-taking in tech industries during the dot-com boom of the late 1990s, and how individual designers took personal responsibility for the collapse of an industry and livelihood; a collapse that was not their fault, but rather the fault of complex economic structures in the United States during that time period. During the question and answer period, Neff was questioned about her reference to external economic structures playing such a large role in the downfall of the first web workers instead of shifting cultural attitudes about the web. After some thought, Neff replied that it was okay to talk about structures again, since sociology and communication are moving into a “post-poststructuralist” moment. In this dissertation I will argue that not only must theorists embrace the post-postmodern in order to better understand digital technology and its designers, but that designers themselves have, for a long while, used post-postmodern discourse.

What is this post-poststructuralist moment, and why is it so important? As the name may imply, certain veins within the social sciences and philosophy are moving past the grasp of poststructuralism and its cousin, postmodernism, which have dominated these fields since the 1960s. Postmodernism, while a disparate and complex intellectual and artistic movement, can be summarized as a focus on questions of knowledge, culture, and power when examining society and the world.³² Poststructuralism and postmodernism were of course responses themselves, notably to the various empirical philosophies of the late 19th and early 20th centuries. In essence, poststructuralism and its ilk were reactions against positivism.

Positivism, which traces its origins from various sources in British and continental philosophy, is generally considered to have been formalized by Auguste Comte. Comte

³² Hess, D. 1997. *Science Studies: An Advanced Introduction*. NYU Press

proposed that humanity was progressing through three stages of thought: theological, metaphysical, and positive. As we advanced through each stage, we shed layers of superstition that cloud the real world from us—first we understand the world through gods and magic, then through metaphysical philosophy, where morals and universal rights exist on a plane separate from the physical world. With the proliferation of the natural sciences in Europe, humanity was moving to the positive stage of development, the final stage of human thought that would allow us to clearly connect with the world around us.

What the sciences allowed for, according to Comte, was theory- and value-neutral propositions. By utilizing empirical methodology, scientists are able to gather objective data from the natural world. When enough data is gathered, conclusions present themselves without the need for metaphysical interpretation. In other words, empirical data speaks. The result is an unfiltered, objective understanding of the natural world, free from superstition and human error—so long appropriate scientific methods were used.

It is Immanuel Kant who theorizes what would become a major critique of positivism and a contributor to postmodernism--phenomenology. Kant takes Hume's thesis of the accumulation of impressions and de-empiricizes it. For Kant, while reality is a series of impressions, it is the human mind which categorizes and orders these impressions into reality. These interpretations are created by *a priori* categories and values that are already present in the mind, and therefore our reality is shaped before we even encounter objects in the real world. Kant calls this perspective on reality the "Copernican Revolution-in-reverse."³³

Kant's reverse Copernican Revolution places the weight and experiences of reality on the human mind, and not on any sort of external world. While this perspective has many serious metaphysical implications, there are two that are most important to postmodernism--

³³ Kant, E. 1781. *The Critique of Pure Reason*

(1), that questions of *how we know* the world must supersede questions of *what is* the world, and (2), that knowledge does not have to be knowledge *of something*, but rather can and does exist independently of experience.

Kant believes that categories within the human mind are universal and *a priori*, i.e., that every human being has a similar conceptual framework with which they approach the world. The universality of worldviews that Kant espoused, however, was undermined by Einstein's Theory of Relativity. After Relativity, philosophers concluded that human beings are not locked into some universal set of categories, but rather that our cognition and perception are determined by one's location in space. For social scientists, the "space" that determines human cognition is culture. Kant's *a priori* categories, in other words, are culturally relative.

The impact of this understanding of mind and culture is the denial of the real world beyond culture, or anti-realism. What this orientation around knowledge constructs, according to philosopher Levi Bryant, is a two-world schema. Under this schema, the world is divided into subjects and objects, where subjects are those who perceive, and objects are elements of the natural world. Human representation of the natural world is determined not by the world around us, but by our cultural, political, and historical backgrounds.

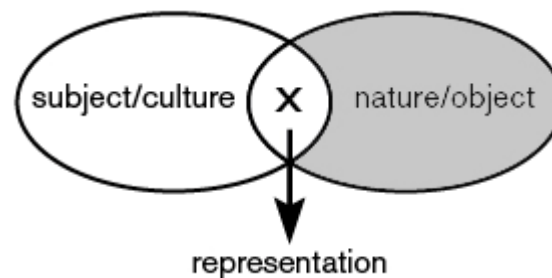


Figure 1: The Subject/Object Split

³⁴ Bryant, L. 2011. *The Democracy of Objects*. Open Humanities Press

If, as Kant theorizes, human reality exists because of our mental and cultural subjectivities, and objects in the world are shaped by human understanding of them, then in order to understand the world, we must understand human perception and culture. As Bryant notes, "the domain of nature and the object has been foreclosed, ...it's been blocked out, and we are to restrict inquiry to what is given in the subject and culture circle." Bryant continues:

While the anti-realist generally does not deny that a world independent of subject, mind, and culture exists--i.e., he's not a Berkeleyian subjective idealist or a Hegelian absolute idealist--the anti-realist nonetheless argues that because representation falls entirely within the domain of the subject and culture we are unable to determine whether representations are merely our constructions, such that they do not reflect reality as it is at all, or whether these representations are true representations of reality as it is and would be regardless of whether it were represented.³⁵

It is via this schema that questions of *what the world is* are transformed into questions of *how do we know the world*. The epistemological swallows up the ontological.

From this anti-realist platform the postmodern moment in the social sciences emerges. Michel Foucault, a leading postmodern thinker (though he would reject the postmodern label placed upon him), would introduce the concept of the *episteme* in *The Order of Things*. For Foucault, the *episteme* is the historical *a priori* which makes possible discourse in a particular time period. Various power-knowledge systems exist in society, and the interaction and premises of these systems form the discursive foundation from which all ideas and representations of the world flow. Even competing theoretical and philosophical theories, such as neoliberalism and Marxism, cannot exist without an agreed upon, if unspoken, set of premises, such as the importance of labor in society. Again, we can see Kant's influence: the power structures and histories of humanity are not tied to material events but to *a priori* categories of the mind; though in this case, the "mind" is culture and discourse.

³⁵ *ibid.* page 15

The concept of *epistemes* should sound familiar to scholars of Science and Technology Studies, as the theory shares many common traits with constructivist readings of Kuhn's scientific paradigms³⁶. Under the paradigm model, scientific progress is not a linear path of discovery of the material world, but rather the movement through different ideologies of thought, or paradigms, over time and generations. Under this model, Relativistic physics was not a progression of Newtonian physics, but rather a replacement for it, taken up by new generations of scientists. Science, which, since Comte, has claimed itself to be a unified path of discovery of the natural world, is turned on its head. We have not discovered more about the world, but rather teach ourselves to think about the world differently. Under the constructivist model, we instead *know* the world differently.

Postmodernism and anti-realism clearly contribute to the laboratory studies of Karin Knorr Cetina and Bruno Latour which I discussed in the previous section. Knorr Cetina states at the beginning of *Epistemic Cultures* that her goal is to continue to disunify the sciences by exploring the different realms of knowledge individual disciplines inhabit. According to Knorr Cetina, particle physics and microbiology exist in different worlds, and are only united as "natural sciences" through discursive convention and through networks of political power.

Science, for constructivists, is a process of cognizing, not of discovery. Ethnographic and ethnomethodological study afford Science Studies researchers an understanding of this creation process because they allow for a critical examination of culture and the power structures which influence scientists and experts, who reflexively influence these cultural systems.

Interestingly, the epistemological focus of postmodernism is not limited to studies of culture and humans themselves. Since all objects are objects of our perception, we can never know the object for itself, and therefore must analyze objects as they relate to humans. This

³⁶ Kuhn, Thomas. (1962). *The Structure of Scientific Revolutions*. University of Chicago Press

leads constructivist social scientists and analysts to sidestep questioning the material properties of the world in favor of questioning how humans construct ideas about the world, or how material properties are perceived by humans. Within the postmodern framework, objects, on their own, are ontologically hollow. According to Bryant:

...the question of ontology is no longer, "what is being *qua* being?" but rather, "what is being *qua* Dasein?" or, "what is being *qua* language?" or, "what is being *qua* power?" or, "what is being *qua* history?" or, "what is being *qua* the lived body?"³⁷

Even scholarly work that attempts to go beyond the focus on epistemology is often trapped by it. Langdon Winner for example, in his now-famous article "Do Artifacts have Politics?"³⁸, laudably calls for a focus on the properties of technology, or, borrowing from Edmund Husserl, to look *to the things themselves*.³⁹ Winner claims that artifacts are political phenomena in their own right, and must be critically examined in such a way. More problematically, Winner cites the example of the overpasses in Long Island, which were designed by Robert Moses in the mid 20th century, to be low-hanging so as to discourage buses and other large vehicles from using freeways. The result was the racial biasing of the freeway system in Long Island. On the one hand, automobile owners, who were generally white and either upper or upper-middle class, had access to vehicles that were able to use the freeway. In contrast, those who relied on buses for transportation--generally blacks, who made up a sizeable percentage of New York's poorer classes--were unable to use the roadways, and therefore were "selected out" of where the freeways led: Long Island's Jones Beach, a high-class public park. Interestingly enough, Winner's historical facts were wrong--there were routes to Jones Beach that were perfectly accessible by bus. However, Winner's idea that ideology can be embedded within artifice is an important one.

³⁷ Bryant, 2011. page 39

³⁸ Winner, L. 1980. "Do Artifacts Have Politics?" in *Daedalus*, Vol. 109, No. 1, Winter 1980.

³⁹ As quoted by Winner

Again, we see hints of postmodernism in Winner's argument. Winner makes an important point about the political effect of the technology--the overpasses. That political effect, however, is not a property of the object itself, but rather a description of its relationship to humans. Like Descartes' wax, it would seem that Winner claims properties only exist as humans perceive them to exist. If there were as many poor whites as poor blacks, would the overpasses still have the same racial-political properties? What if newer buses were designed with lower profiles? Whatever the answers to these questions, Winner has still not taken us to objects considered in of themselves as opposed to their relationship with humans.

Given the dominance of poststructuralism, how can Gina Neff have said that we are entering a post-poststructural moment? For one thing, even theory like Winner's points to some focus on the properties of objects, which signals a drift towards ontic, as opposed to epistemic, matters. We even see constructivists like Knorr Cetina write articles about "epistemic objects" and "objectual practice."⁴⁰ Whatever is meant by these terms, she is at least pointing towards ontology.

What Neff may be referring to as the "post-poststructural" is in fact an "ontological turn" in both philosophy and the social sciences. The past decade has seen the rise of new schools of theory that are attempting to look more deeply at ontology, such as Actor Network Theory, Object Oriented Ontology, and Critical Realism. Actor Network Theory (ANT), which largely owes credit to Latour, is much more concerned with the ontological relations between humans and non-humans in causal networks. Object Oriented Ontology (OOO), particularly the mould espoused by Levi Bryant, Graham Harman, and Ian Bogost, call for a decentering of the human when evaluating the world. In OOO, there is no separation between "the social" and "the natural;" natural things like trees and houses and social things like cultures and relations

⁴⁰ Knorr Cetina, 2008. "Objectual Practice". in *Knowledge as Social Order: Rethinking the Sociology of Barry Barnes*. (Ed.) Mazzotti, M. Ashgate Publishing Company

are all objects that exist in different states of being. Actor Network Theory, Object Oriented Ontology, and the "ontological turn" are all a part of what Diana Coole and Samantha Frost call the rise of "New Materialism."⁴¹

Many of these ontologically-focused or materialist frameworks borrow from Marxist ideas, not the least of which is Critical Realism, and its founder Roy Bhaskar. Bhaskar, a British philosopher of science, was one of the first thinkers to highlight some of the issues that arise from conflating questions of being with questions of *knowing* being--or conflating ontology with epistemology, which he calls the "epistemic fallacy."⁴² As a philosopher of science, Bhaskar is concerned with reconciling the historical and cultural backgrounds of scientific inquiry with the *actual* objects in the world which impact scientific work. In an oft-cited passage, Bhaskar writes:

Any adequate philosophy of science must find a way of grappling with this central paradox of science: that men in their social activity produce knowledge which is a social product much like any other, which is no more independent of its production and the men who produce it than motor cars, armchairs or books... This is one side of "knowledge." The other is that knowledge is "*of*" things which are not produced by men at all: the specific gravity of mercury, the process of electrolysis, the mechanism of light propagation. None of these "objects of knowledge" depend on human activity. If men ceased to exist sound would continue to travel and heavy bodies fall to the earth in exactly the same way, though *ex hypothesi* there would be no one to know it.⁴³

What Bhaskar is referring to is the struggle to talk about intransitive objects--objects that would exist even if humans did not--despite the fact that humans can only perceive these objects in human-biased ways. There are many more colors of light, for example, than the human eye can perceive. Even if we use instruments to detect that these other colors exist, we can never actually *know* them, we can only *know of* them. For in this Kant, Foucault, and the anti-realists are correct: we can never escape the phenomenological world, and in order to contemplate something we must have the linguistic tools to do so.

⁴¹ Coole, D. and Frost, S. 2010. *New Materialisms*. Duke University Press

⁴² Bhaskar, R. 1998. *A Realist Theory of Science*. Routledge

⁴³ Bhaskar, 1998. page 21

How then, can we talk about objects without talking about our knowledge of them? In short, the answer is *we can't*. In order to discuss the properties of an object, we must know, or at least know of, the object in question. Epistemology and ontology rely upon each other. This dissertation in no way proposes that we can do away with questions of epistemology, or that we don't need to discuss concepts of power and culture when analyzing the digital design community. In fact, even postmodern constructivists like Donald MacKenzie and Judy Wajcman emphasize that "...the social shaping of technology is wholly compatible with a thoroughly realist, even materialist, viewpoint"⁴⁴ and, as my next section will detail, culture is an incredibly powerful influence, and an active part of, the design community.

I propose, in other words, that analysts must focus on the materiality of the objects and technologies with which digital designers engage in order to understand digital design. More controversially, I will argue that both humans and non-humans can be members of the design community. This dissertation will argue that the focus on epistemic issues has clouded the impact that objects have on technological development. Research agendas should place a greater emphasis on the technologies that both enable and are produced by digital design via their own properties. Doing so will offer a greater understanding of the affordances and constraints of design, as well as reveal that design is both a process of creation and also a process of discovery, and one whose discourse is dominated by ontological talk.

Extending the Actor-Network

How can non-humans have an active role in the design of art and technology? Consider the following quote from a 2002 issue of *Wired* talking about n_Gen. The n_Gen engine, a layout mock-up program, is built to aid designers in the creative process. The algorithms which contribute to the creation of new layouts are essentially guided randomness--layouts and web

⁴⁴ MacKenzie, D. and Wajcman, J. 1999. *The Social Shaping of Technology*. pg. 18

pages are generated randomly within certain constraints governed by the amount of text, the selected style, and basic design principles. While n_Gen itself would become a footnote in design history, the way n_Gen is talked about in the quote below is quite common in the digital design community, and, as this dissertation will argue, quite telling about the role that non-humans play in design discourse and practice.

It's software with a sense of humor - and a parody of the cookie-cutter look of much graphic design. The n_Gen engine, developed by San Francisco's Move Design, can churn out an infinite number of layouts. Just supply the text and select from one of five current styles (California Noir? Die Modernist?). Using proprietary algorithms, the program mocks up the words with style-specific fonts and images in design after design - as fast as you can hit the n_Generate button. "Graphic designers already do this sort of iterative work," Move's Samuel Lising points out, "but n_Gen does it faster and with greater ease." Lising and partner Peter Spreenberg don't see their application making designers obsolete; they view it as a handy tool that will challenge conventional methods.⁴⁵

Notice the abilities and personality traits that n_Gen is reported to have. Lising and Spreenberg, the developers of n_Gen, note the program's status as a tool; in addition to using the word "tool," they take care to say that the application probably won't make designers obsolete. Despite the rhetorical orientation of the program as a tool and as something unable to displace human work, notice the abilities and personality traits attributed to the program within the article. n_Gen has "a sense of humor," it mocks up, it churns out, it does the same work that designers have done--but faster. Finally, n_Gen will challenge the conventional methods and culture of graphic design itself. Quite a lot of aspirations for just a tool!

Social scientists like Knorr Cetina have explored the tools that contribute to technological and creative processes. She provides excellent insights into the treatment of physical objects in laboratories by scientists, such as particle detectors in high-energy physics labs. How well-tuned and how well-built an individual detector is influences the accuracy of the

⁴⁵ Wired, May 2002 "Got Design?"

data that it collects, leading experienced physicists to trust certain detectors more than others, and to even refer to them as living beings. Knorr Cetina captures this attitude in an interview with a physicist:

A detector is a tool, a toy and a friend or whatever, which is used to measure something and the result of our job. So in a way we shouldn't care at all about the detector. But in reality, okay, we live so long with that object, it's like a human being...⁴⁶

The scientist that Knorr Cetina interviews treats the detector like a human being. The idiosyncrasies of the machine impact the way that scientists do their job, so much so that they consider operating the machine "living with" it. The detectors seem to be alive. Knorr Cetina cites other objects which likewise have agentic vitality in the laboratory, including background electrical noise that interferes with accurate energy readings, mice in medical labs who resist being killed, and even the internal organs of the deceased mice themselves, who can be "uncooperative" when they don't show results that scientists may expect.

Similar discourse emerges in the digital design community. When talking about BlackBerry Messenger's (BBM) role in social media-fed flash mobs and riots, Bill Wasik writes in a *Wired* article:

But BBM is private, decentralized, blindingly fast, and—most important—ubiquitous. [...] For tech to become effective as a tool for civic disorder, it first had to insinuate itself into people's daily lives. Now that it has, there can be no getting rid of it. The agent provocateur lives inside our pockets and purses and cannot be uninstalled.⁴⁷

Like the physicists' detectors, BBM "lives." While still referred to as a tool, BBM had to "insinuate itself into people's lives" and "cannot be uninstalled." BBM is represented as an object that has powers and abilities independent of the humans who use it; although, unlike the friendly detectors, BBM can be insidious, as noted by the use of "agent provocateur." Not only

⁴⁶ Knorr Cetina, K. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press, pg 122

⁴⁷ Bill Wasik, *Wired*, January 2012, #Riot

does BBM seem to have powers that operate independently of humans, it appears to be some sort of "self" in its own right.

While examining the labeling of detectors and mouse parts by the scientists themselves as living objects, Knorr Cetina makes an interesting analytical move. Knorr Cetina theorizes the detectors and mice as being "transformed" into actants by the scientists. In other words, the objects in the laboratory have been categorized as living things and described using anthropomorphic terms, such as "living" or "dying." Consider the following statement from Knorr Cetina:

Why apply a biological process such as aging to a technical event? The technical vocabulary should be strong enough to carry the message—the deterioration of the measurement response—to which detector "aging" refers. Why are chunks of experience, perfectly well described in technical terms, symbolically recoded?

I want to suggest that imaginative vocabularies in HEP (high-energy physics) experiments express the reconfiguration of objects and subjects with which I have associated laboratories. Through symbolic repertoires, it is made apparent how the structure of things is reset in epistemic practice.⁴⁸

What is important, in other words, is the structure of the laboratory and its components as imagined and configured by the physicists. While not necessarily denying the objective properties of the detectors, Knorr Cetina is more interested in the symbolic construction of the detectors by the scientists, and the scientists' categorization of objects within the lab. For Knorr Cetina, the structure of the laboratory is not something that can be empirically measured, but rather is constantly renegotiated by the human workers present. This renegotiation of structure echoes the negotiation of meaning in Communities of Practice Literature that was discussed earlier in the chapter—the structure of communities and the properties of objects are intersubjectively determined by the members of the CoP.

⁴⁸ Knorr Cetina, 1999 page 113

Knorr Cetina's focus on the epistemic construction of the laboratory environment is understandable given the influence of Kantian philosophy and poststructuralism in both Communities of Practice literature and Science Studies. It is also, in its own right, an important series of questions. However, as discussed in the previous section, this focus on the epistemic, or on the construction of reality, shifts the analytical lens away from the ontologically objective features of the object in favor of the perception of the object by its human users. Human agency, then, is placed in a prime position, whereas non-human elements in a space are evaluated only via their perception by or use by humans.

One again, objects are left ontologically hollow, waiting to be defined and constructed by their human masters. As digital design discourse will reveal, objects are not ontologically hollow. They, in fact, have powerful causal impacts upon the digital design community. Science Studies has recently provided a theoretical framework that allows for an analysis of both the human and non-human agents within a community that begins, though does not finish, the work of de-neutering objects. This framework, popularized by theoreticians like Bruno Latour and John Law, is called Actor-Network Theory.

Actor-Network Theory (ANT) is, to say the least, a contentious analytical tool. ANT is both material and semiotic, seemingly saying that actors both have their own *a priori* properties but yet also have their properties determined *a posteriori* by the network in which they reside. Latour himself is famous for his (now recanted) statement, "There are four things wrong with Actor-Network Theory: the words actor, network, theory, and the hyphen."⁴⁹ But allow me to divest myself of these muddied waters for the moment, and for now focus on the most basic--and for this dissertation, the most important--elements of ANT.

⁴⁹ In the workshop Actor Network and After

Essentially, Actor-Network Theory conceptualizes the world as a system of relationships, or a network, among nodes, or actors. Each actor contributes to the network, and mediates power, knowledge, and causality (more on causality in a moment) among the other actors. Actors, then, have agency. Consider, for example, an introductory-level college class on Marx. The professor educates the students in the classroom on Marx's theories. The knowledge of Marx, however, is not transferred wholesale or unchanged. The professor selects which readings and theories of Marx are important to impart to the students and, if they're a good teacher, imparts this knowledge in a way that students who have no prior understanding of social theory can understand. Marx's ideas are therefore mediated by the professor.

The students themselves are also agents in the network, and therefore are mediators. They (hopefully) listen to the professor's lectures, and then must absorb the information given to them. Again, the students will not absorb the information wholesale, but will instead reconstruct Marx's theories--as already mediated by the professor--into terms and ideas that they can understand. In an ideal setting, Marx's ideas, the explanations of those ideas by the professor, and the understanding of those explained ideas by the student are more or less similar.

The idea of mediated knowledge construction is not unique to ANT. Where ANT diverges from traditional constructivist notions is that non-humans too can be mediators, and therefore actors, in the network. Most often the "agent" label is applied to technology, which reflects ANT's origins in Science, Technology, and Society circles. If the previously discussed Marx class were taught online, for example, the microphone the professor speaks into, the camera she records herself on, the speakers the students listen to, and the monitor they use to see the professor would all be mediators. These technologies inevitably change the interaction between the professor and the students, and therefore between the students and the

information. Depending on how deep the researcher wants to analyze the material components of the computer system, agents within the network can be classified together, or *punctualized*. In an online class, the computer, microphone, and monitor can be evaluated as separate agents, or punctualized as "the online communication system," or even de-punctualized into the individual circuit boards and programs which allow each object to function. If we consider the Marx class a Community of Practice, then the communication system itself would need to be analyzed as a contributor to the practice within the community.

Even non-technological objects can be agents in the actor-network. Perhaps the most famous example of "natural" objects participating in an actor-network are the scallops in Michel Callon's "Domestication of the Scallops and the Fisherman of St. Brieuc Bay,"⁵⁰ where the scallops are portrayed as impacting the wealth and operation of the fishing industry in France as much as the fishermen themselves.

The introduction of non-humans as agents is generally the most critiqued premise of ANT, and the cause of much of the controversy over its use. The arguments are usually twofold: (1), communities and networks are inherently constructed and epistemological, and therefore non-social objects (i.e., non-humans) that appear to be participating in them are actually just symbolized as participants by the humans who make up the network, and (2), that agency requires intentionality, which requires consciousness; therefore only humans can be agents. The history of Argument 1 was briefly introduced in the previous section, and the argument against it will be explored in Chapter 2. I am actually sympathetic towards Argument 2 (though I would argue that animals, too, possess intentionality), but believe the problem comes down to one of labeling.

⁵⁰ Callon, M. 1986. "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay" pp. 196–233 in *Power, Action and Belief: A New Sociology of Knowledge*, edited by John Law. London: Routledge & Kegan Paul.

What ANT scholars call agency is essentially the capacity to produce change within a given system. However, the term *agency* does have a long tradition in sociology and philosophy of being associated with intentional actors, like the individual moral agents of Kant or the collective agency of classes or "*geists*" from Marx and Hegel. At worst, ANT scholars may be misusing agency, and at best they seem to be picking a fight where there needn't be one. I would argue that ANT would be better served by replacing *agency* with a concept borrowed from Critical Realism and Object Oriented Ontology: *causal powers*.

Causal powers are the objective properties embedded within objects and persons which enable them to exert force upon others and themselves. Causal powers break with the covering law model--covering laws take the agency out of things. Causal powers restore agentic vitality to objects, and are therefore a post-positivist concept.

The concept of causal powers is similar to ANT's use of agency with two exceptions--it avoids the theoretical baggage of intentionality that comes with agency, and it posits that the ability to change systems is a quality of the object itself, not one given to the object by the network it resides in. To borrow Levy Bryant's example of the acorn⁵¹, the acorn does not have the power to grow into a tree because of the dirt around it, or because of water, but because of the internal properties of the acorn itself--though the properties of dirt and water are sublimely useful in actualizing those properties.

In our online classroom example, the professor, the students, and the computer networking system all have powers which they exert upon one another. These powers can be actualized creatively and unexpectedly, and are by no means law-like, so those who fear the demon of determinism can begin to unclench their jaws. The computer system does not

⁵¹ Bryant, 2011. page 117

determine the behavior of the human participants in the classroom, but it would be equally naive to suggest that it does not exert forces that alter their behavior either.

While I will go into deeper detail about the nature and background of causal powers in Chapter 2, it is important to denote here a theoretical point upon which I diverge quite dramatically with Latour and other ANT scholars. Actor-Network Theory confines itself to what Bhaskar would call the physically manifest. All of the agents identified within Actor-Networks are physical --humans, scallops, professors, computers, students. However, where does this leave culture, or abstract elements like morality? What about social structures? What for that matter, are the ideas of Marx that are getting mediated from professor through computer through student?

For Latour, culture, values, ideas, and social structures are emergent phenomena that the Actor-Network must constantly perform in order to exist. A university, for example, is not a distinct object, but rather is a collection of offices, computers, professors, students, and administrators who regularly and constantly interact with one another. The "university" is just a way of describing the sum set of all their activities--should their performativity stop, the university would cease to exist. Under this schema, social structure, culture, and ideas are reduced to epiphenomena.⁵² A similar explanation would be offered for Marxism in the classroom--if students and professors stopped talking about it, it would no longer exist.

This dissertation will argue that not only are structures, ideas, and values *real*, but also that they are a type of object, objects that participate and mediate within causal networks of digital design. In addition, it will be argued that these ideas have properties and qualities that are not bound and warped by the subjective interpretations of individuals, but are in fact objective. To put it bluntly: ideas too are actors that have causal powers.

⁵² Porpora. D. "What is Truth?" (not yet published)

In this dissertation, one idea set that has greatly influenced the digital design community of practice is Science Fiction. Bre Pettis, the cofounder of MakerBot, a 3D printer manufacturer, claimed that the design for his most recent 3D printer was inspired by "Darth Vader driving KITT while being airlifted by a Nighthawk spy plane," and his frequent use of customizable color LEDs in his designs was implemented to look "something like in the movie *Tron*."⁵³ The name of his printer series, by the way? The Replicator, named after the machines that generate food and other matter for the crew of the *Enterprise* on *Star Trek: The Next Generation*. This dissertation will explore the (sometimes conscious) impact science fiction has on the design world, not only through the popularity of sci-fi shows, books, and movies in general culture, but also because of the ideas and objects generated through science fiction.

Where Do We Go From Here?

This dissertation will argue that the digital design community is one that discusses, engages with, creates, and discovers the properties and qualities of design, art, technology, and pop culture. While doing so, the predominant discourse and practice involved is largely ontological in nature, not epistemological. In short, this dissertation will argue that the digital design community is, in fact, an *Ontic Culture*.

Chapter 1 will explore identity and roles within the Community of Practice of designers. In doing so, it will go beyond the professional ranks ordinarily examined by Science and Technology Studies and look at amateurs and students, and will survey designers from animation houses as large as Pixar, to the five-man team at Cipher Prime, to the individual designer on his personal computer. This chapter will demonstrate that despite the disparate types of practice that digital artists in various fields engage in, they consider themselves to share a unified skills set, often interact in similar spaces, and share similar terminology and discourse.

⁵³ Anderson, C, (2012) "The New Makerbot Replica Might Just Change Your World," Featured in *Wired* September 2012

It will also present evidence of design discourse working its way into the general population, and clouding what it means to "design."

Chapter 2 will show that designer discourse often focuses on the causal properties of objects in the world, and not on how designers *can know* these objects. Following this discourse, this chapter will argue that the technology has objective features and properties that impact the designers as much as the designers impact the tool. In addition, Chapter 2 will introduce a realist framework for understanding the existence of objects within the digital design community. It will argue that, even though many technologies are created by the designers themselves, digital designers are often engaged in acts of discovery with the technologies they design, and the creative process is often both enhanced and hindered by the emergent properties of new technologies. Finally, Chapter 2 will make a more controversial point--that certain types of objects, generally those who are powered by software, are often constructed "selves," and contribute to the intersubjective meaning-making of the design community. These objects, then, can be members of the community of practice.

Finally, Chapter 3 will use realist ontologies to argue that ideas and social structures are themselves objects who participate in the Actor-Network of digital arts, and therefore in the digital design community of practice. A major source of the idea-objects that take place in design discourse, and therefore the main objects of this analysis, is speculative fiction. This chapter will reveal that not only does speculative fiction serve as a creative inspiration for digital artists, but also that artists analyze the objective properties and qualities of idea-objects, reverse engineering them in a similar way that archaeologists and designer-biologists reverse-engineer artifacts and organisms in an effort to understand, recreate, and improve upon them. To conclude, this chapter will demonstrate that technologies are not the only idea-objects from science fiction that impact the design Actor-Network. In fact, the qualities of characters,

histories, and philosophies from science fiction often form a moral and political compass that influence ethical outlooks and decision making during the design process.

Chapter 1 - Communities of Practice, Who and What?

"If you were a part of geek culture--or simply wanted to immerse yourself in a worldview that seemed the Newest Thing around--you cleaved unto Wired.... History belongs to the victors--and the Wired version of digital technology's impact on society has been the victorious one, if only because it got there first."⁵⁴
 -Paulina Borsook

Who is the Digital Design Community?

The purpose of this dissertation is to rigorously examine the digital design Community of Practice, their discourse, the design process, the technology they use and that uses them, and the extra-practical features of design work. In doing so, I will critique current understandings of Communities of Practice (CoPs), and expand these understanding of CoPs by incorporating theoretical models taken from Actor-Network Theory, Critical Realism, and Object Oriented Ontology. The ultimate goal of the dissertation is to provide a deep empirical understanding of the digital design community, as well as to forward a theoretical model for understanding digital creative communities more generally, whom I label Ontic Cultures.

It is important to quickly reinforce here that while I will argue that digital artists and others from various fields are members of a digital design community, and therefore designers, I do not pretend that my observations and ideas in this dissertation can be applied to all types of design. From personal experience, I can attest that the cultural, technical, and gendered paradigms that digital artists and, say, interior designers operate in are drastically different.

As we will see later on this chapter, identifying and bounding the digital design community is problematic because of the "democratization of design," or the concept that as digital technology becomes more accessible, and digital literacy increases, the ability to use these systems in order to design will become a common skill. This is not just an academic idea.

⁵⁴ Borsook, P. 2000. *Cyberselfish: a Critical Romp Through the Terribly Libertarian Culture of High-Tech*. Public Affairs, a member of the Perseus Books Group, New York, NY, pp. 135-136

The New York Times, in fact, boldly declared that "Everyone's a Designer" in 2010.⁵⁵ Hopefully not, for the purposes of my project! For if everyone's a designer, then no one is.

So, like Descartes' meditations, I started from the most basic source of information I had - myself. Prior to beginning my dissertation research, I had been part of the digital design community for almost a decade, as an undergraduate and graduate student in the Digital Media program at Drexel University, as a web developer, 3D animator, and game designer at Comcast, and as a freelance developer and consultant for several small companies. My friends and colleagues "in the industry" ranged as far as graphic designers and digital photographers at small, independent web-developing firms to technical directors and lead artists at large companies like Pixar, Dreamworks, and Microsoft XBOX Live. All of us considered ourselves to be part of the digital design community, even though we collectively had a hard time describing what "digital design" is.

During the conversations I had with these artists, developers, programmers, and designers, several trends of thought about who the digital arts and design community was began to unfold. First, and perhaps most obviously, were the professionals who worked in the commercial sector of digital entertainment, people like character modelers and lighting technicians at Disney, environment artists and A.I. scripters at Blizzard Entertainment, and graphic designers and web developers at Google. Many of the people working in these positions had the word "designer" in their job description, and all worked for companies that use digital technology to produce aesthetically pleasing, functionally useable, commercial products. "Art applied with purpose."

Surprisingly, however, a second group of individuals was also sometimes included in the general consensus of designers: amateurs. Game modders, Photoshop users on deviantART,

⁵⁵ Buschel, B. 2010. "Everyone's a Designer." *The New York Times*, Small Business Section, October 19, 2010

free-time Linux developers, students, and semi-professional freelancers were all (generally) considered to be part of the digital design Community of Practice. Some of these non-professionals were clearly aiming to build a portfolio in order to attempt to enter the professional design world, particularly students and freelancers, but many were not. In Nathaniel Poor's investigations into the game modding community, for example, only a combined 20% of modders agreed or strongly agreed that they were modding and designing games in order to help them break into the games industry.⁵⁶ Conversely, a combined 89% of modders agreed or strongly agreed that they modded "because it was fun to do," and 73% agreed that they modded in order to "make the game more fun for other players."

When pressed on the inclusion of non-professionals in the digital design community, some of my colleagues would respond with something along the lines of "well, they do design work." They are creating or manipulating digital systems, and usually doing so with a creative, artistic eye. This, despite their recognition that, as amateurs, they are more akin to consumers than producers. The high level of acceptance of Poor's phrasing of the response "to make the game more fun for other players" by modders reinforces their positioning of themselves as consumers.

Is this a result of the "democratization of design?" At first glance it would certainly seem to be. However, my "pilot-informants" made sure to emphasize that not *all* creative work performed digitally counts as design. "Facebook creativity," in particular, was adamantly condemned as non-design. Arranging your photos in a particular way in your Facebook photo album, or cleverly making your cover photo and profile picture interact⁵⁷ is not design work.

⁵⁶ Poor, N. 2013. "Computer Game Modders' Motivations and a Sense of Community: A Mixed Methods Approach." *New Media and Society*, published online on September 24, 2013

⁵⁷ Part of the problem with writing a dissertation that directly refers to a popular use of a digital interface is that, inevitably, the popular use fades away or, more problematically, the interface itself radically changes, as any long-term Facebook user can attest to. For older readers, or for readers picking up this

Interestingly enough, using WYSIWYG ("What you see is what you get") web design platforms like Wordpress or Wix is also *not considered* doing design work. Designing these design platforms, though, is. Clearly, then, for digital designers, not *everyone* is a designer. There must be some level of vetting into the community, even if that vetting isn't necessarily professional recognition.

Of course, this collectivist hypothesizing doesn't mean much without data. While many sites across the digital design Community of Practice were examined, including, as noted in the previous chapter, SIGGRAPH and Cipher Prime, the backbone of my empirical analysis comes from a content and discourse analysis of *Wired* magazine. Which should raise a large question: if I am studying digital designer discourse, then why look at *a magazine*?

The answer, simply put, is that I am going to argue that *Wired*, taken alongside more qualitative observations of talk at design studios and designer gatherings, provides a survey of the discourse of the breadth of the digital arts community over time. More specifically, *Wired* provides access to the types of discourse found not only in professional digital design, but also across popular/amateur digital design. Most studies of the "high tech" community⁵⁸ or the "creative culture"⁵⁹ community are predominantly focused on the types of action that occur within a workplace. While this is certainly valuable, ethnographic studies of professional design studios necessarily prevents the researcher from understanding the view of the non-professional. In order to understand how the professional and amateur nodes of the digital design Community of Practice talk, researchers need to find a discursive site where both

soon-to-be famous manuscript decades from now, 2013-era Facebook users could select a profile picture, which was supposed to be something akin to a picture of their face, and a cover picture, which was a larger, overlapping "expression" picture. Some users would use a profile picture and a cover picture that seemed to interact, like a large cover picture of Godzilla eating a small profile picture of the user screaming. Now you know!

⁵⁸ Gina Neff

⁵⁹ Creative cultures book

professionals and amateurs are involved. *Wired* is the major professional/amateur site of discourse that I analyze here.

Is Wired Part of the Community of Practice?

There will understandably and reasonably be some resistance to the idea that a popular magazine, particularly one like *Wired* that may have a reputation of being past its prime, can function as representative discourse for a Community of Practice. Wouldn't it be easier and more accurate to describe *Wired* not as part of the Community of Practice, but rather as part of a "geek culture" or "cyberculture" public? Why would I insist on the CoP moniker?

What is the difference between a public and a CoP? Michael Warner describes the notion of a public as a social totality or as a concrete audience, a group of people bound together by a common discourse⁶⁰. The collective readership of one website, or one newspaper, or one magazine, such as *Wired*, can be considered a "public". The readers of this dissertation can also consider themselves to be in a kind of community or public with one another, however small that community may be. In the experience of reading this dissertation, you are bound together both with myself as its writer and with its other readers.

Publics, according to Warner, can also be constituted as a system of relationships between strangers. Rather than a more familial setting where every member knows each other within a social space, publics may forge bonds among people who may have no prior connection with one another. In many cases, publics form bonds between people who have never met each other, and likely never will.

Is *Wired*, then, a public? I believe the answer would have to be "yes." *Wired* has a readership, a collective knowledge base, and a place in geek and tech culture. The Tech-geeks,

⁶⁰ Warner, M. DATE. *Publics and Counterpublics*

designers, businesspeople, and general interest audience that read *Wired* most certainly constitute a public, and I would argue that *Wired* has played and continues to play a large role in high-tech culture.

So why then make the theoretical leap to categorize and analyze *Wired* as a Community of Practice? Publics are oriented around types of talk because they are interested in that type of talk. Anyone who has even a passing interest in technology can pick up a copy of *Wired* and read it, and become part of its public. According to the digital design community, not everyone can just "be" a designer. I am going to argue that while it is true that *Wired* exists as a Community of Interest and a public, a substantial portion of its readership, its authorship, and the discourse within *Wired* exists as part of a Community of Practice.

No, Really, Is Wired Part of the Community of Practice?

A crucial part of my argument hinges on the idea that the discourse found within Communities of Practice is somehow fundamentally different than discourse that can be found in any interest group or public. So what exactly is a Community of Practice, and what would we expect the discourse therein to look like?

As discussed in the Introduction, the term "Communities of Practice" was introduced by Jean Lave and Etienne Wenger in 1991⁶¹ as a way of thinking about "experts groups" who produced knowledge. Lave and Wenger come from an Anthropology of Education background, and were initially concerned with how knowledge production groups fostered learning outside of a classroom environment. These learning groups could be after-school tutoring programs, "skill's building" classes for adults, or, more commonly, apprenticeship programs, where new individuals would come to the group with the expectation of gaining knowledge or expertise.

⁶¹ Lave, J. and Wenger, E. 1991. *Situated Learning: Legitimate Peripheral Participation*

Part of this knowledge and expertise was learning not only the practical skills and methods of their particular craft, but also learning how to correctly socialize themselves with the other members of their community.

For Lave and Wenger, Communities of Practice are generally small, self-organized groups of people who attract one another because of some shared expertise, and who have knowledge sets that they both wish to share with one another and gain from one another. In their first book, *Situated Learning*, Lave and Wenger explore a range of Communities of Practice, from Yucatec midwives to meat cutters to nondrinking alcoholics.

What types of discourse occur in Communities of Practice? According to Wenger,⁶² Communities of Practice interaction comes in three forms: mutual engagement, joint enterprise, and shared repertoire. Mutual engagement is the socialization work done in Communities of Practice, the interpersonal connections forged among community members that create the sense of solidarity within the CoP. Hanging out in a computer lab and ordering fast food, the typical domain and sustenance of finals week digital arts students, helps to form this bond of community, and contributes to the structure of the CoP. Joint enterprise is the creation of the shared understanding of the common expertise that brought the community together in the first place. This talk is more meta than practical in nature; it may have to do with defining the goals and values of the particular CoP or those of the expertise and trade at large. The Design Forum's stated purpose, "design is there to make people's lives better," supposedly culled from the opinion of several designers, is an example of "joint enterprise" talk at work.

Finally, shared repertoire is the "shop talk," the practical discourse that provides the members of the CoP with useable knowledge and resources for which to perform their expertise and, importantly, perform them better. Wenger argues that shared repertoire is not only the

⁶² Wenger, J. 1998. *Communities of Practice: Learning, Meaning, and Identity*

most common thing generally associated with Communities of Practice, it is also the most common form of talk within them.⁶³

Lave and Wenger in particular focus their studies of Communities of Practice in physically co-present locales--places where people actually meet up, in person, to engage in practical discourse. Lave and Wenger typically examine classrooms, boardrooms, training halls, and educational centers. While there have been several notable arguments for expanding the conception of Communities of Practice beyond places of physical co-presence,⁶⁴ it may be best to begin my argument for *Wired* as part of the digital design Community of Practice by

examining the membership, structure, and discourse of locales more readily accepted as CoPs. The part of the design CoP, or, if you will, *sub-Community of Practice* that I will start with is

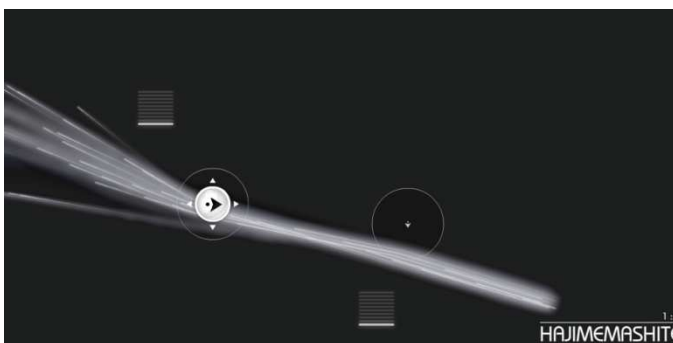


Figure 2: Cipher Prime's "Auditorium"

the Philadelphia-based independent video game development studio, Cipher Prime.

Cipher Prime was founded in 2008 by William "BJ" Stallwood and Dain Saint. Stallwood came from a career in IT and as a playtester⁶⁵, and Saint had a background in the creative arts and in music production. Their first game, *Auditorium*, was released in 2009 and largely publicly

⁶³ *ibid.*

⁶⁴ See, for example, Dube, L.; Bourhi, A.; and Jacob, R. 2005. "The Impact of Structuring "The impact of structuring characteristics on the launching of virtual communities of practice". *Journal of Organizational Change Management* and Shumar, W. and Renninger, K.A. 2002. *Building Virtual Communities*. Cambridge University Press

⁶⁵ In the games industry, playtesters are the lot who get to play unfinished version of games, over and over again, in order to look for, and document, bugs in the design and programming. While it may sound at first glance like it's the greatest thing ever to play videogames for a living, the long hours and repetitive nature of testing can make this job quite soul-sucking. For some playtesting testimonials, I highly suggest that readers check out The Trenches (www.trenchescomic.com), a webcomic detailing the lives of testers.

funded by Kickstarter. *Auditorium*, like most of Cipher Prime's subsequent games, is an "experience" game in which the player progresses through levels by solving puzzles that involve manipulating graphical representations of sound. The player "wins" by manipulating enough of these sound waves through various directional, amplitudinal, and transformative nodes that are provided in each level. There are no time limits present, and no "enemies" to speak of, just tasks to complete. At the completion of each level, the player is rewarded with the playing of the sound wave they just manipulated.⁶⁶

To date, Cipher Prime has released four games in addition to *Auditorium*, *Fractal*, which was released in 2010, *Pulse* in 2011, *Splice* in 2012, and *Intake* in 2013. The first three games are similar in feel to *Auditorium*, with a relaxed, puzzle-solving atmosphere set to appropriate music, while *Intake* has an upbeat, aggressive, arcade-style shooter element to it. Cipher Prime is also currently working on a multiplayer sequel to *Auditorium*, *Auditorium Duet*, that is also almost completely Kickstarter funded. In addition to having won several independent game developer awards, their games have been featured in some of Steam's⁶⁷ Indie Bundles, a sign of general admiration for their games by the consumer public.

The personnel makeup of Cipher Prime is fairly typical of a small games studio. While Stallwood and Saint are the founders and figureheads for the company, the development team at Cipher Prime can grow up to five or six developers, depending on the scope of the current project and funding available to them. To date, all the developers that I have met at Cipher Prime are male, which reflects an industry that, while slowly changing, is largely dominated by men. As an aside, while it is difficult to accurately identify gender in online participation, several

⁶⁶ A screenshot from an early level in *Auditorium*, where the player must manipulate the stream of sound (the white particle stream) to activate the sound level measurers (the gray bars) by using direction modifiers (the circles with arrows)

⁶⁷ Steam is an online media distribution system which largely features video games, and is incredibly popular in the gaming community. Steam "Bundles" often take several of the most popular games in a genera and sell them in bulk at a discounted rate.

of the online, non-professional game design and modding groups I examined also seemed to be dominated by male participants, although the number of women in the non-professional scene seemed to be larger than in the industry.

How does Cipher Prime fit into Wenger's Communities of Practice model? It would be hard to argue that Cipher Prime does not participate in mutual engagement, the building of social ties within the CoP. There were of course structural socializing forces like having an office space, particular work schedules, and collaborative work tasks. Though on the surface these elements may seem more work-based than community-building or socialization-based, Gina Neff has shown that, particularly in the high-tech industry, long work hours and collaborative efforts often become intertwined with socialization and community member policing.⁶⁸ Being "in the trenches" during a deadline crunch, which often involves sleep deprivation, high levels of stress, and higher levels of Chinese take-out almost forces team members to bond in order to relieve some of the pressure of the situation. Crunches also serve as trials-by-fire. Successfully navigating a high-pressure collaborative work environment proves three important things in the digital design community: that you are committed enough to the product or tech at hand to sacrifice other parts of your life to it, that you have the technical skills required to be an asset to the rest of your team, and that you have the fortitude to handle that type of workload. In effect, this type of work environment often leads to either a culling or a self-selection of the community, one that can be particularly cruel to older employees or workers with families. Cipher Prime's development team consists of mid twenty and thirty year-olds, a common demographic in the digital art trenches.

The norms and necessities of design business practices are not the only forms of mutual engagement at Cipher Prime. Employees also participate in "extra-curricular" socializing

⁶⁸ Neff, G. 2012. *Venture Labor: Work and Burden of Risk in Innovative Industries*. The MIT Press

activities during and after the work day. The team members take part in exercise drills outside of their office after work together, frequently order food and eat together, and often play videogames together. During my observations there, *Starcraft II*, a science-fiction themed Real-Time Strategy game by Blizzard Entertainment, was the current office obsession, and intra-employee tournaments and bouts were common.

What about joint enterprise, the "meta-talk" that CoP members use to define the goals of their field? While it's rare to see *in situ* talk that explicitly states the nature and goals of "good game design" (partially because of the lack of a definition of design in the first place), we can tease this type of talk out from within other forms of discourse. For example, CIPHER PRIME has a running developer (dev) blog on their website where they ruminate about the state of the industry, games, science fiction, and the nature of art.⁶⁹ Consider the following post where Stallwood is reviewing popular games and reverse-engineering what makes them so successful. In this particular excerpt, Stallwood is talking about GRID 2, an urban racing game developed by Codemasters:

One thing I'd like to point out in particular about GRID is that Codemasters excels at how they handle camera movement. The replay camera really caught my attention in the first game. The default replay view follows the car around the track with a keen sense of framing, so that you're not always just looking at the back of the car or have it centered in the viewport. The camera actually leads ahead of the car and anticipates directional movement, keeping the vehicle at a position on screen in line with the rule of thirds. It also pivots the camera angle to take in more of the scenery around the track. The attention to real-time cinematic detail in GRID is some of the best I've seen in a game. In GRID 2 they've taken it even further, improving the driver's camera movement so that it anticipates corners and directional changes during gameplay — giving the driver a better perspective on the track and a more natural and fluid feel behind the controls.⁷⁰

⁶⁹ <http://blog.cipherprime.com/musings/>

⁷⁰ Stallwood, B.J. "Hey, It's Research, Baby." Blog post from May 30, 2013, posted on CIPHER PRIME's dev blog, "Musings" (<http://blog.cipherprime.com/musings/2013/05/hey-its-research-baby/>)

What does this excerpt reveal about the nature of good game design? Stallwood mentions GRID's creative use of the replay camera--the virtual camera that represents the player's viewpoint during gameplay--works because it manages to both provide the viewer with a clear understanding of the position of the player's avatar (in this case, the car) while also providing an aesthetically pleasing, cinematic visual experience that is consistent with the "rule of thirds" technique from cinema. GRID 2 takes these same techniques and applies them to the real-time camera during gameplay, but also introduces an artificial intelligence component that allows the camera to anticipate and predict the actions of the player--and to respond to those predictions by positioning itself for the best view.

Stallwood's praise of the camera properties in the GRID games would seem to line up with the "function and form" generalized definition of design mentioned at the beginning of the chapter. The camera offers the functionality of offering the player useable views of the racetrack while the camera also positions itself cinematically. This specific example of good design within one game's camera system also begins to reveal Stallwood's understanding of the goals of digital design, and therefore reveals the presence of the meta-talk which categorizes joint enterprise. Also take note of the focus on the properties of the camera, gamespace, and cinematic "rules" in the piece--this is the type of ontological talk employed by digital artists and designers that will be explored more in the next chapter.

Shared repertoire, or "shop talk," is easily found in design houses like Cipher Prime. "Tutorial" style talk in the professional setting is uncommon outside of a classroom or workshop--it's rare to see one designer take another through a step-by-step process of creation. The dominant form of "shop talk" in the digital arts community comes through critique, or the analysis of work for positive or negative attributes, and, usually, the offering of suggestions for

improvement (although every designer has, at some time, gotten the always-useful "this is crap, do it again" critique).

Cipher Prime, like all design companies, engages in critique at all levels of the design process, from brainstorming through development and programming to the rollout of the final deliverable. Design is a reflexive process, where ideas are created, then evaluated, and then, ideally, improved. Critique is not always negative, and can also take the form of evaluating the ideas and properties of external products in order to better your own product. Take, for example, another excerpt from Stallwood's dev blog post, where he is excitedly praising the creative ways in which Valve Corporation designers leveraged technical constraints of game graphics engines to produce high-quality, efficient visuals in their online battle arena game DOTA 2:

What drew me to DOTA 2 in the first place was the Workshop system. Valve has provided users with an interface for creating items for hero characters in game. While looking through the Art Guide for DOTA 2, I was amazed to see how they handle their texture maps. Each hero and item makes use of just four texture files. The first two are pretty standard: one consisting of a diffuse map for color, and the other a normal map for showing physical detail on low-poly meshes. The last two are really interesting: four additional texture maps are shoe-horned into each file. They're able to do this by using the image's four channels — red, green, blue, and alpha — independently of each other for storing gray-scale shader masks. Brilliant! If you're an artist interested in doing any sort of 3D work for video games, it's worth your while to check out DOTA 2.⁷¹

While not a tutorial per se, Stallwood is identifying the particular technical details of the texture maps (the images that give 3D models their coloring and texture) that DOTA 2 uses as examples of "best practices," a technique that game designers should be aware of and consider replicating. Specifically, the technique of stacking multiple texture maps within one file is useful because it allows the designers of DOTA 2 to give their characters multiple layers of texture, which increase the detail of the character model and give the digital artist more freedom when

⁷¹ *ibid.*

designing the character, but limits the amount of processing power and memory space texture maps use, a consideration for ensuring functional, smooth gameplay across multiple types of computer systems. I consider this type of discourse to be a kind of shared repertoire because of the more technical nature of this post compared to the GRID post which discussed camera movement and was identified as joint enterprise. While both posts can be understood as enthymematically expressing "meta-talk"--that cinematic views of the gameworld and that high-quality, low intensity graphics respectively are desirable design goals--the DOTA 2 post contains a more specific breakdown of the individual properties and techniques used by the developers in order to achieve these goals. Again, note for the next chapter the focus on identifying and understanding particular ontological properties of the techniques used.

It would seem, then, that Cipher Prime is a co-located group of individuals who share a common expertise whose discourse reflects mutual engagement, joint enterprise, and shared repertoire, which would seem to qualify it as a Community of Practice. However, part of the reason why Cipher Prime is such a great sample of the digital design CoP is because of their place beyond just in the professional design world. At the end of the last blog post about the textures in DOTA 2, you may have noticed an important sentence: "If you're an artist interested in doing any sort of 3D work for video games, it's worth your while to check out DOTA 2."⁷² Why would Cipher Prime put in qualifying statements about the readers wanting to be artists and wanting to work in 3D games in a development blog for a game design company?

Cipher Prime understands itself as a part of the digital arts community as a whole, including not-yet professional and amateur designers. The company also makes a major effort to reach out to these individuals by holding weekly "Game Dev Nights," an event every Thursday evening where Cipher Prime invites anyone interested in gaming and digital art to hang out in

⁷² *ibid.*

their studio, bring computers and cards, play games, and work on projects individually or collaboratively. Every month, one of the Dev Nights is a scheduled "Game Jam" night, where both the developers at Cipher Prime and the Game Dev attendees compete in a twelve hour, 6 PM to 6 AM, game development competition. Designers compete either individually or in groups of two, and create a game from scratch in the time allotted, usually inspired by a loose theme, such as "Player 1 versus Player 2" or "Sound." The games are played the following Dev Night, and the crowd favorite wins bragging rights.

Dev Nights themselves can be considered Communities of Practice within the Community of Practice of Cipher Prime. They express mutual engagement: the gatherings are a hybrid social space and learning space. A major part of the fun of Dev Nights are the various games Cipher Prime provides or designers bring, and from picking out where to order food. Dev Nights will also frequently break out in impromptu game tournaments with, again, bragging rights in the balance. Tournaments I saw featured games like the aforementioned *Starcraft II* as well as newly released smaller titles, such as Andrew Morrish's *Super Puzzle Platformer Plus*, a *Tetris*-like block destruction game with a twist--you play as a character in this land of blocks, trying to destroy enough blocks so that you aren't crushed by them, but also save enough blocks so that you can stand on them without falling to your death.

While every Game Dev night includes discourse that could be considered joint enterprise and shared repertoire--the members often discuss more abstract concepts of "good game design" in addition to helping one another with coding problems or navigating production software--Game Jams are particularly fruitful for this type of discourse. Because the night is focused on creating a piece within a twelve hour timeframe, more practical discourse like joint enterprise and shared repertoire comes to the foreground, and Game Jammers often give each other advice, comment on general game ideas, and playtest each other's work.

What is particularly fascinating about Game Jam nights is that the games designed do not necessarily have to be computer-based. While most of the participants do use computers and game-design or scripting software to create digital games, the "rules" of the Game Jam also allow for the creation of card games, board games, athletic games, and even game design documents, or write-ups of the storyline, goals, and mechanics of a game that act as a guide book for the production of the game itself, similar to a script for a play, complete with stage directions.

Game jammers and dev nighters certainly do gain a greater understanding of the processes in which digital games are made as well as, in most cases, experience with professional-grade development software. Cipher Prime, in fact, provides attendees with weekly licenses for Unity 3D, a popular game development engine; if people come to Game Dev Night every week, they can essentially possess a free version of a very powerful professional development suite. However, as evidenced by the Cipher Prime's encouragement of non-digital game creation during Game Jams, participants do not necessarily need to have any digital expertise at all to engage in game design. This Community of Practice, which is centered around digital game development, does not completely consist of members who have the skills or technical knowledge to actually create a digital game. At the same time, we should not confuse Cipher Prime Dev Nights with an interest group--while the members of this community all share an interest in videogames, they also share an interest in the design of games as well. They are congregating not just as consumers and fans, but also as producers and builders.

The game designers at Cipher Prime have a broad perspective of the identity of designers--they are individuals who are both professionals and amateurs, experienced and inexperienced, skilled and unskilled. This is perhaps because of Cipher Prime's position as a small, independent developer; while they are a growing name in the gaming industry, they

certainly don't have the economic clout or advertisement reach of larger, "Triple-A" studios such as Electronic Arts or Sony Computer Entertainment. From a sales perspective, it would seem more worthwhile for smaller companies like Cipher Prime to foster more interpersonal connections with prospective consumers. Holding events like Game Dev Nights would contribute to that. That being said, the interactions during Game Dev Nights and Game Jams, the types of talk on the Cipher Prime blogs, and conversations with the founders of the company very rarely feel like hidden sales pitches. There is never any pressure to buy their products (although the developers will let game jammers playtest their current projects), and the atmosphere is one of collective play and exploration. Cipher Prime seems genuinely invested in fostering the talents and creativity of newcomers to the industry as well as those who enjoy game design and programming in their spare time.

Before turning to *Wired*, there is another part of the digital design Community of Practice that I want to explore: the Association for Computing Machinery's Special Interest Group on Computer Graphics and Interactive Techniques, or SIGGRAPH. In a broad sense, SIGGRAPH is a professional organization that distributes newsletters, maintains job boards, and hosts and guides various local chapters of the Association worldwide. However, when those in the digital arts community refer to SIGGRAPH, they are generally referring to the annual, week-long SIGGRAPH conference, held once a year, usually over the summer.

The SIGGRAPH Conference has been held every year since 1974, and takes place in an American or Canadian city each year. SIGGRAPH is a huge event for the digital arts and computer graphics industry, as evidenced by the number of attendees: the SIGGRAPH meetings generally attract over 15,000 people a year, and sometimes many more.⁷³ The conference hit its attendance peak in 1997 with over 48,000 attendees, and although attendance at the

⁷³ Data from Jon Peddie Research, presented at SIGGRAPH 2013, Anaheim, CA

conference has been dropping, it still attracted over 17,000 people in 2013. These attendance numbers are more or less in line with other major digital arts conferences, such as the Game Developers Conference, which averages about 18,000 attendees a year (although GDC is growing rapidly).

At first glance, the design community represented at SIGGRAPH is substantially different than the group seen at Cipher Prime. Unlike Cipher Prime, SIGGRAPH is largely catered toward the professional ranks. While technically the annual SIGGRAPH conferences are open to anyone who buys a ticket, the ticket pricing structure is very cost prohibitive: tickets for non-members will cost around \$1000, and even the cheapest tickets that are focused towards design students who are registered at universities will cost around \$500. Many of the attendees have their registration and travel costs covered by their companies and institutions, something obviously out of the reach of the amateur designer. When the conferences began in 1973, SIGGRAPH was held at an American city in a different part of the country each year, often alternating between the East and West Coasts. Since 1995, the SIGGRAPH conferences have been held in either the Los Angeles/Anaheim area or in Vancouver, two major sites for the professional animation and cinema effects industry, 12 times.

Every SIGGRAPH conference hosts various companies and vendors from across the computer arts industry, many of whom are there to try to convince both large studios and individual artists to purchase the latest version of their creative software. The target audiences and philosophies of the software companies vary greatly; they range from companies like Autodesk, that will charge \$1800 to \$6000 for versions of Maya and 3D Studio Max, their flagship 3D modeling and animation suites, to organizations like Blender, who's flagship 3D package of the same name is open-source and 100% free of charge. Both companies had large displays at SIGGRAPH, though they marketed themselves differently--Autodesk products are

widely considered to be the industry standard and are often a major component in the production pipelines of Hollywood films, and as such are very particularly marketed towards industry effects houses and professionals. Blender, though it sometimes spins a "we're just as good as-" campaign, focuses its free, completely editable software towards smaller studios, individual artists, and amateurs. Thus, while the majority of attendees are large studio professionals, there are fragments of catering towards smaller houses and amateurs as well.

In addition to the vendor halls, SIGGRAPH also hosts Exhibitions and Emerging Technologies events, where companies, individuals, and universities and other research groups give sneak peeks of various internal research projects they have developed in the past year. These technologies are incredibly varied: at SIGGRAPH 2013, some of the exhibits included the AquaTop Display,⁷⁴ a game which uses motion tracking systems to allow users to interact with projected images on the surface of water, a full body exoskeleton⁷⁵ a la Ripley's in *Aliens*, although intended to be used to aid quadriplegics, and a camera-mirror system⁷⁶ which captures images of those standing in front of it and warps their expression to make them seem happier. Some of these previews are intended to try to attract investors or prospective buyers for their technologies, while others use the forum as more of an academic conference--as a way to get people talking about your research and get valuable feedback. The majority of the Emerging Technologies exhibits have functional or prototype versions of the software or hardware for demonstration, and the exhibits can serve as free playtesting for researchers.

⁷⁴ The AquaTop Display was developed at The University of Electro-Communications in Tokyo, Japan by Yasushi Matoba, Yoichi Takahashi, Taro Tokui, Shin Phuong, Shingo Yamano, and Hideki Koike

⁷⁵ The EMY (Enhancing MobilitY) suit was developed at the interactive robotics unit of CEA LIST, based in Paris, France, and the SIGGRAPH 2013 Presentation was given by Yann Perrot, Alexandre Verney, Boris Moriniere, and Philippe Garrec

⁷⁶ The project, titled "Incendiary Reflection: Evoking Emotion Through Deformed Facial Feedback," claimed to change user's moods by showing the user with a more positive expression on their face. The project was developed at The University of Tokyo in Tokyo, Japan by Shigeo Yoshida, Sho Sakurai, Takuji Narumi, Tomohiro Tanikawa, and Michitaka Hirose

SIGGRAPH also features a highly-competitive technical papers portion of the conference. SIGGRAPH describes the Technical Papers Program as “the premiere international forum for disseminating new scholarly work in computer graphics and interactive techniques.”⁷⁷ The papers presented are often written by researchers at universities with computer graphics or computer science programs, by the research and development arms of large studios like Pixar and Industrial Light and Magic, or by individual artists, some of whom work for large studios and some who are more independent. While they are called “Technical Papers,” there are a wide variety of paper topics. There are indeed many papers which are very technical in scope; these papers often have a programming or computational slant. These types of papers included topics on how to best compute the elastic dynamics of thin layers of skin⁷⁸ and algorithms for digitally “beautifying” handwriting.⁷⁹ These papers follow a scientific/engineering format and highlight the techniques or algorithms created.

Other papers are less technical but still concrete. Pipeline panels are common, where artists and directors from different companies show sections of their production pipeline from previous projects. In essence, a project pipeline is the process through which digital projects are completed, and includes human labor, hardware labor, and software packages. Pipeline design is always a balancing act, as simple, streamlined pipelines often lead to faster, cheaper, and more efficient results, but more complex projects require more complex pipelines. A popular SIGGRAPH legend tells the tale of a pipeline panel discussion that featured South Park Studios and Industrial Light and Magic (ILM) in the mid 2000s. South Park Studios, which produces the animated comedy *South Park*, gave a short presentation on that showed the pipeline for one of

⁷⁷ From the SIGGRAPH 2013 Technical Papers web page, last accessed 1/12/2014:
<http://s2013.siggraph.org/attendees/technical-papers>

⁷⁸ Li, D., Sueda, S., Neog, D.R., Pai, D.K. 2013. “Thin Skin Elastodynamics.” Presented at the Technical Paper proceedings at ACM SIGGRAPH 2013

⁷⁹ Zitnick, C.L. 2013. “Handwriting Beautification Using Token Means.” Presented at the Technical Paper proceedings at ACM SIGGRAPH 2013

their recent episodes, which used three or four animators, the Maya software package, and two or three nodes⁸⁰ from the compositing program Nuke to complete an entire episode. ILM then showed their pipeline for *one shot* from *Star Wars: Episode III*, which featured over a dozen artists and programmers, six or seven software packages, and over 50 Nuke nodes in order to produce the scene. While the South Park pipeline was certainly more streamlined, ILM's shot won the unspoken "coolest pipeline" competition.

Still other papers and panels feature "meta-art" topics, where artists debate the artistic merits of certain techniques or talk about their inspirations for pieces they have completed in the past year. Although proportionally these papers and panels make up only a small part of the scholarly proceedings (technically-oriented papers dominate the program), they are by far the most well-attended; many of these talks which are held in normal conference rooms instead of larger lecture halls are "falling over each other" standing room only. One of the most popular talks at SIGGRAPH 2013 was the "Face Off" panel, where several technical directors from animation studios debated the merits of motion-capture technology vs. traditional keyframe animation⁸¹ when animating character faces in movies and games. While a small part of the talk

⁸⁰ In Nuke and other "node-based" software packages, "nodes" are the visual representations of algorithms that either import or export footage or add some special effect to that footage. These nodes are then connected together and linearly process the footage to achieve the artist's desired "look." A simple node sequence might be a node that imports video footage, which is then connected to a node that makes that footage black and white, another node that adds digital film grain to the footage, and then a node that publishes the footage as a new movie file, all of which are connected together to give a film scene a classic, "film noir" look.

⁸¹ Facial motion-capture techniques involve recording a live actor's face in a studio, and using software to track the movement of various points of their face, like the corners of the mouth, the cheekbones, the jaw, and eyebrows. These captured data points are then applied to a similar network of points on a 3D model, which, with a lot of tweaking, give the model the actor's facial movements. Animators using keyframe animation techniques have move the control points on the 3D character by hand, and record the spatial positions of these points. The recorded position of every control point on a given character at one given point in time or within one frame of the movie sequence is called a keyframe. The animators then reposition the control points on the character a few frames later and create another keyframe. The animation software then interpolates the positions of the control points in between the two keyframes, and moves those points accordingly, so that the animator does not have to manually control the character in every frame of footage

was about the technical advantages and disadvantages of motion capture and keyframe techniques, most of the panel discussion was centered around which technique had a better “look.” Although the panel participants would reference the technical properties and pipeline implications of both motion capture and keyframe animation, they referenced them in terms of style: the cartoonish, exaggerated look of keyframing and the precise, light, and sometimes hollow and marionette-like look of motion capture. The audience in this talk was also particularly vocal, with opinions and arguments voiced by other animators, game designers, and computer scientists.

SIGGRAPH serves a wide variety of digital artists; on their attendee survey handed out at their 2013 conference in Anaheim, CA, the options available for the question "Which of the following best describes your organization's primary business or industry?" include 3D Graphics, DVD Authoring, Game Development Tools, and Web Design/Authoring/Streaming Media services. However, the major clientele of the conference leans towards Hollywood Visual Effects (VFX) studios; talks and presentations given by Pixar are heavily attended, as are the technical talks that focus on animation and VFX. 27% of the 2013 conferences' attendees identify as part of the Film and Television Production industry, whereas Game Developers, Independent Artists, and Researchers only make up 12%, 13%, and 14% of conference attendees.⁸² The price point for entry, the domination of highly technical papers and mostly expensive software, and SIGGRAPH's regular locales of Hollywood production hubs Los Angeles and Vancouver suggest that the conference organizers' presumed audience is a professional one. Despite this, there is some representation of the non-professional designer at SIGGRAPH, like Blender (although you could certainly argue that Blender's end goal is to *become* an industry standard tool) and various academics.

⁸² Demographics are taken from SIGGRAPH 2013's "Information for Exhibitors" webpage, which can be accessed at s2013.siggraph.org/exhibiting-siggraph-2013

Like Cipher Prime, the demographics at SIGGRAPH are overwhelmingly white (plus a substantial Asian minority) and overwhelmingly male. Interestingly enough, ACM SIGGRAPH itself does not gather demographic data on race or gender, while it does gather information on profession, salary, location, and purpose of visit. As noted by Stephanie Wildman, the lack of identification of gender or race within an organization, or the dismissal of gender or race as important factors often suggests the privilege of being the dominant gender or race group, and therefore considered the default.⁸³ Advocacy groups like WomenGamers.com and companies like Her Interactive and the long-defunct Purple Moon have all made concerted efforts to support women digital artists by awarding scholarships to women game design students or women designer hiring efforts, but have unfortunately not yet been able to have a major impact on the industry. Conversely, the Twitter movement #1reasonwhy, where women in the games industry collectively chronicled the barriers and discrimination women can face in professional game development, spawned a great deal of discourse within the design community as a whole, but this discourse and the hashtag quickly faded a few weeks after its inception in November 2012.

This gender imbalance is also an important way of separating the design community from more consumer-based geek or tech culture as a whole, which is much more diverse. In fact, women have historically been a large consumer base for certain digital design products, such as video games and digitally animated movies (a statistic that has been largely attributed to mothers buying products for their children), and, as of 2011, women made up 53 percent of the mobile gaming population and 40 percent of the console and PC gaming population.⁸⁴

⁸³ Wildman, S.M. (1996). *Privilege Revealed: How Invisible Preference Undermines America*. New York University Press

⁸⁴ Flurry analytics

SIGGRAPH would seem to live up to these gendered expectations. While the number of female authors in technical papers has increased in the past decade (one in four technical papers now include at least one female author), the proportions of the audience walking the conference floor seemed to be substantially more skewed male than that. Both SIGGRAPH and Cipher Prime reflect the overall male dominance in the professional digital arts.

Can we still call SIGGRAPH a sub-Community of Practice within the digital design CoP? The structure of SIGGRAPH is very different from Cipher Prime; while online newsletters are emailed to members a few times a week, the SIGGRAPH conference itself is only held once a year, although local and student chapters meet much more frequently. There is also less practical work done at SIGGRAPH than at Cipher Prime--most of the conference is centered around the demonstration of new technologies or new work, whether through the Technical Papers, the Exhibition Hall, or various film festivals and animation showcases throughout the show.

While discourse is not all that matters, it is still an important part of a Community of Practice. Despite the structural differences between SIGGRAPH and Cipher Prime, SIGGRAPH still exhibits much of the same types of discourse that helps define Cipher Prime as a Community of Practice. Designers at SIGGRAPH certainly undergo mutual engagement—the moments of interaction and discourse that build the social and collaborative relationships that connect members of the Community of Practice together. Some moments of mutual engagement at SIGGRAPH are explicitly structured for the building of collaborative connections. In a typical Silicon Valley/Alley⁸⁵ style, SIGGRAPH hosts several “networking parties” throughout the week, where attendees are provided free food and drinks, and swap business cards and “elevator speeches,”—the 30-second speech that says why the designer or the designer’s product is the

⁸⁵ Neff, G. (2012). *Venture Labor: Work and Burden of Risk in Innovative Industries*. The MIT Press

Next Big Thing, and is short enough to deliver to someone important during an elevator ride with them. During networking parties, individuals are often looking for investors or collaborators for their next projects, or may be trying to hook up with the hottest production companies, which at SIGGRAPH 2013 were clearly Pixar and Blizzard Entertainment.

Not all forms of mutual engagement were as structured, nor were they as professionally-oriented. In the digital arts, artists and designers are constantly shifting their perceived role in the community between producers and consumers. Unlike many “experts communities,” many of the individuals who come to work in the digital arts industry were first introduced to their craft as consumers. When asked, game designers often credited their childhood experiences playing games as the moments that laid the foundation for their pursuit of game production. They enjoyed playing games, so they wanted to make a career out of making games. A similar narrative exists among animators and web designers, a narrative which I am sure resonates across non-digital artistic communities as well. In contrast, comparatively fewer doctors talk about their childhood experiences getting needles in the doctor’s office as laying the foundation for their interest in medicine.⁸⁶

SIGGRAPH plays with the producer-consumer dual identity of digital designers. One of the main events of the conference is the Animation Festival, a two-hour, late night showcase of what have been voted as the best animated shorts of the past year. These shorts come in several forms, from five minute short stories, to cutscenes from videogames, to music videos with heavy CG influences, to car commercials. Before the festival begins, SIGGRAPH attendees are led into a large screening auditorium via a red carpet, mimicking the celebrity culture of various Hollywood awards shows. By walking the red carpet, digital artists are playfully

⁸⁶ Anonymous, citing a report from the American Association of Medical Colleges, as found on the KevinMD blog: <http://www.kevinmd.com/blog/2012/06/reasons-future-doctors-choosing-medicine-changed.html>

engaging with celebrity identity while also engaging with resistance to that celebrity. The digital artists who work on Hollywood films are just as important to the final look and feel of the film as the producers, directors, and actors who are paid substantially more than the production artists, and who are given much more face time at Hollywood events—if the artists are even invited to these types of parties in the first place. SIGGRAPH, however, becomes a Hollywood event just for digital designers. Here, they are the celebrities, their role in cinema and the arts is celebrated, and they are able to take their rightfully earned stroll down a red carpet.

After the red carpet walk, however, artists undergo a transformation from movie producers into consumers via the classic moviegoer trope—popcorn. Each SIGGRAPH attendee is given a bag of popcorn, contained within a classically red-and-white striped paper bag. A few thousand folding chairs are lined up like seats in a movie theatre, and each designer shuffles to find the best seats left available in the house. You can tell the shift from producer to consumer is complete when, at the start of the first film, the lights dim and ushers walk back and forth through the open aisles to make sure no one is attempting to record the movies shown with a phone, tablet, or Google Glass. During the festival, there is little evidence that the audience watching these movies is any different than any audience watching any movies across America—with the possible exception of vocabulary that leans a little more towards the technical side during the chatting in between shorts.

The event serves as both a showcase for some of the best work the digital arts field has produced in the past year as well as a celebration of digital arts culture. Both the networking events and more social events like the Animation Festival are examples of mutual engagement because of the social connections they forge and the reinforcement of notions of what it means to be a designer they provide. This type of discourse is similar to the mutual engagement discourse found at Cipher Prime: the designers and producers there share a common practical

interest in producing digital games, but also engage in social activities that increase bonding as well as make for a better collaborative work environment. Cipher Prime discourse also shows the negotiation of identity between producer and consumer that often occurs within the digital design community. B.J. Stallwood analyzes DOTA 2 and GRID not only because of the properties that make them excellent examples of game design, but also because they were fun to play—his first experience with these games was as a consumer, not a producer.

The SIGGRAPH community also engages in joint enterprise, the meta-talk that creates the boundaries and domain of the community. As mentioned earlier, SIGGRAPH takes pains to construct itself as an organization comprised of digital professionals in its press releases, its internal surveys, and the selection of retailers and companies they invite to participate in the Exhibition Floor. While the talk on the floor largely reflects the professional bent of the organization, there is also plenty of non-industry related talk as well. It's fairly common to overhear debates over what should be called the best Pixar film (it's *Up*, by the way), or whether it's cool or ridiculous to be walking around wearing Google Glass. Also common are critiques and discussions of artists' independent work. It is very common, particularly in the modeling and animation scene, to spend a good deal of time outside of work playing around with different software packages and modeling or effects techniques. Sometimes this is done to test out a technique or platform before applying it in a professional setting. Other times artists will perform "speed modeling" challenges, either against each other or against themselves, where they have to model and create a virtual character from scratch in an hour or two—this practice serves to sharpen the artist's skills and each their time saving techniques that can be valuable on the job. More importantly, speed models are usually uploaded to Instagram or Facebook for bragging rights.

Often, however, this outside the workplace production is done just for fun, for the excitement of creating artistic pieces or the challenge of pulling off particularly detailed and vivid renderings. The discourse surrounding this type of non-professional work reflects the producer-consumer identity that digital artists tread. The artist employs software packages and plugins for professional production, but they can also be “fans” of particular software or the pipeline style that the software encourages. This type of extra-professional work and “fanboy” discourse surrounding creative suites and techniques also serves to define the domain of production for digital designers—the types of work produced and the new types of work that become capable of being produced by creative packages make up the accepted boundaries of what constitutes digital design.

Finally, audiences at SIGGRAPH also engage in shared repertoire, or discourse that creates, teaches, and augments the practical skills and techniques that members of a Community of Practice use when engaging in their practice. This discourse may be literal step-by-step instructions or tutorials, and it may also consist of discussions of “best practices,” or general guidelines to follow when practicing within the domain of the CoP. While at Cipher Prime the shared repertoire discourse largely took the form of best practices and critique, SIGGRAPH showed a much higher concentration of tutorial-style discourse. These tutorials often came in the form in “Master’s Classes,” or training seminars, short courses that were open to attendees on a first-come, first serve basis.

The training seminars general featured one of two different goals: first, there are generalist courses taught by a well-respected designer in a particular industry that are intended to be an introductory-level, “get your feet wet” design experience. The “Mobile Game Creation for Everyone” class, for example, introduced participants to a few creative software packages used to game development on mobile devices like cell phones, and walked the audience

through basic scripting and mobile game design using one of these software packages. Other introductory classes may be less technical, but still teach softer foundational skills. The class “Story: It’s Not Just for Writers... Anymore” focused on the need for programmers and artists to understand basic narrative construction tools like character motivations and satisfying narrative arcs and plot development.

Second, there are expert’s level courses that offer advice and tutorials to participants who already have a high level of specific technical skills. The class “Numerical Methods for Linear Complimentary Problems in Physics-Based Animation” was as intimidating as it sounds to the novice animator. The course outlined a number of techniques for solving mathematical inconsistencies that arise within physics engines, the system of computational algorithms that control the behavior of gravity, wind, and other world physics simulations within a videogame. While many game developers understand how to employ physics engines, relatively few have an understanding of the actual mathematics behind them, much less deep enough of an understanding of the mathematics to be modifying them.

It makes sense for a conference like SIGGRAPH that caters to high professionals to have training sessions for expert-level producers. So why include a large percentage of classes that cater to beginners? The answer lies in the variability of skills and technologies that exist within the domain of digital design. While various digital arts require quite different knowledge sets—producing an app for a mobile device involves radically different techniques and software tools than producing a large-budget console game or rigging a character model for animation—they are all considered by digital designers to be subsets of a greater digital arts practice. As demonstrated in the Introduction chapter of this dissertation, the Visual Effects Solidarity International organization (VFXSI) plainly states that Hollywood visual effects producers and game designers are both a part of the same community. In the survey that SIGGRAPH passes

out to its attendees, the conference organizers ask what other conferences participants attend. Among the options listed are the Game Developer's Conference (GDC), the annual National Association of Broadcaster's conference (NAB), and the International Broadcasting Convention (IBC). The NAB and IBC are broad conferences like SIGGRAPH that cater to broadcasters, film and video producers, and web and social media developers, whereas the GDC is more focused on game design and development. The GDC, however, makes a greater effort to reach out to amateur and independent game designers, academics, consumers, and the press.

The digital design community, therefore, expects and accepts that even seasoned design professionals will be limited in their areas of expertise when compared to the whole of the domain of digital art. The fact that seminars like the training session at SIGGRAPH this even exist, however, is evidence that the community also expects its members to be interested in exploring the various sub-domains of practice, to build both technical and softer skills, like web programming and storytelling techniques, respectively. This joint enterprise discourse therefore serves to both broaden the skills sets of members of the community and also broaden the domain of practice the community centers around.

Both Cipher Prime and SIGGRAPH, then, exhibit discursive and functional features of a Community of Practice. The individuals that form the community are present out of a desire to create and pursue a practice, not just out of a shared interest in digital art. The community members socialize with one another, define the domains of their practice, and learn how to become better practitioners by interacting with one another. Structurally, SIGGRAPH and Cipher Prime are quite different, and the individuals within each of these groups have varying levels of expertise and come from several different foci of digital art. However, the degree of unity and shared interest and skill sets among these different artistic and practical foci, as well as the discourse of the community members themselves, suggests that Cipher Prime and

SIGGRAPH and, more largely, practical disciplines like web design, animation, and game design, are not separate Communities of Practice, but in fact part of a large, varied digital arts Community of Practice.

I argue that, insofar as the structural and discursive differences among Cipher Prime, SIGGRAPH, and other digital arts groups are concerned, these groups are best theorized as *sub*-Communities of Practice. They each have variations in membership makeup, domain definition, and practice, but all contribute to a larger, unified, practical discursive thread.

Given the theorization of Cipher Prime and SIGGRAPH as parts of the whole of the digital design Community of Practice, what can we glean, generally, about the identity of the digital design community? In general, the digital design community seems to be predominantly white males, although the demographics are slowly shifting towards a more gender-diverse community, if not more racially diverse. As shown above, their practical domain is varied, but the various practices that are included in the digital arts tend to feature a combination of both programming skill as well as an artistic eye. Despite this, they are a community in which a lack of technical skills or the lack of a job title are not necessarily barriers to entry (although, in the case of a \$1000 SIGGRAPH entry ticket, money certainly can be). Technical skills and professional work are both highly respected and valued, but so are more abstract viewpoints on the concepts and techniques used within the Community of Practice, as evidenced by Cipher Prime's encouragement of board game development during their Game Jams. Both amateurs and professionals can be considered digital designers, although it is certainly easier to label professionals as such. Their discourse features mutual engagement, joint enterprise, and shared repertoire. Finally, while digital designers are both demographically and discursively distinct (although not necessarily excluded from) from general tech or geek consumer base, they live a split existence as producers and consumers of digital art.

Given these analyses and descriptions of the digital design Community of Practice, we finally come back to our original questions: is *Wired* representative of digital design discourse, and can we include discursive sources that also appeal to consumers, such as *Wired*, as members of the digital design Community of Practice?

Wired

Wired Magazine was first published in January 1993, and founded by Louis Rossetto and Jane Metcalfe. Rossetto, a journalist, and his partner Metcalfe were interested in publishing a magazine that would appeal to those actively in the tech scene, but that would also focus on the broad impacts of digital technology and the growing “New Economy” on the western world. *Wired* touted itself as being uninterested in consumer technology itself—this was not the magazine to read if you were looking for reviews of the latest Walkman or Laser Disc player—but instead on the ramifications that living alongside technology would have on both the individual and society at large.

To that end, Rossetto and Metcalfe hired Kevin Kelly, an editor of *Whole Earth Catalog*, a New Left, libertarian-leaning counterculture magazine. Kelly and the other editors at *Whole Earth* promoted an individualist, techno-centric ethos, one that shunned overarching power structures in favor of the individual, his wits and spirit, and his technology. Take, for example, an excerpt from the first page of a 1969 issue of *The Whole Earth Catalog*:

We are as gods and might as well get good at it. So far, remotely done power and glory—as via government, big business, formal education, church—has succeeded to the point where gross defects obscure actual gains. In response to this dilemma and to these gains a realm of intimate, personal power is developing—power of the individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested. Tools that aid this process are sought and promoted by the Whole Earth Catalog.⁸⁷

⁸⁷ Whole Earth Catalog, 1969, page 1

As we will see, such rhetoric is very reminiscent of the promises of technology in *Wired*, particularly in early *Wired*. The individual who has the consumer power to purchase these various technologies and the technical know-how to use them to their potential has the ability to break the bonds of government, business, and religion—the power structures that hinder individual progress in favor of a slow, flawed, centralized power structure.

Kelly brought with him many editors and writers from *Whole Earth*. Arguably the most important of these writers was Stewart Brand, the founder of *Whole Earth* and a public intellectual who was largely known for his importance to techno-environmentalist movements, his work as a technology writer and critic, and his scientific work alongside computer engineers like Douglas Engelbart and with the MIT Media Lab.⁸⁸ Brand would contribute often to *Wired*, both as a columnist and as an advisor to Kelly. Brand and Kelly's influence and philosophies would prove invaluable to *Wired's* survival during the early years, as they gave the magazine the distinct identity that made it so attractive to the hackers, counterculture enthusiasts, geeks, and software engineers that made up the bulk of *Wired's* early consumer base. By catering to those in the high-tech industry in Silicon Valley and Silicon Alley, and by filling their magazine with quotes and articles written by top industry personnel, popular thinkers, and futurists like William Gibson and Bruce Sterling, *Wired* quite successfully placed itself at the head of a social and thought movement that prized technological innovation and touted the beacon of new technology. *Wired* rode the success of the dot-com boom and the American "New Economy," which promised to revitalize the global economic system with a shift away from industrial production towards information production. The speculative nature of the New Economy, where high-tech and dot-com companies were valued based upon their presumed future

⁸⁸ For a more in-depth history of Stewart Brand and his relationship with *Whole Earth* and *Wired*, I highly recommend Fred Turner's book, *From Counterculture to Cyberculture*.

potential as opposed to current profitability, was, for a time, pulling America out of the economic lull of the late 1980s.

Around the turn of the millennium, however, *Wired* lost large segments of its initial audience, and was faced with a struggle to maintain its relevance and market share. The supposed “fall of *Wired*” was blamed on two factors: first, the burst of the dot-com bubble in 1999-2000, which seemed to invalidate the potential of technology and of the “New Economy” centered around digital information distribution that Silicon Valley and *Wired* had so tirelessly advocated. Second, the purchase of the magazine by the Providence Equity Partners, a financial investment firm, and its subsequent sale to publishing magnate *Conde Nast*, a company traditionally associated with more mainstream magazines such as *GQ*, *Vogue*, and *The New Yorker*, took creative and final editorial control away from Rossetto and Metcalfe. This move, along with *Conde Nast*’s decision to replace Kelly with editor-in-chief Chris Anderson, signaled a shift in content and style away from the niche “hacker” market and zine-inspired, underground look towards a more mainstream tech-savvy audience with a sleeker, “high fashion” style.⁸⁹ While these business decisions saved the magazine from going under during the dot-com collapse, they also served to alienate the counterculture market that *Wired* had cultivated. For many in the counterculture, high-tech culture, *Wired* had lost its soul.⁹⁰

Despite the change in ownership and editorial staff, Kelly and Brand still contributed articles and editorials to the magazine, and as we will explore more over the next several chapters, their particular brand of techno-libertarianism and techno-utopianism had pervaded tech and geek culture, and that impact continued to be felt in *Wired* and the tech scene after their departure. Despite the demographic shift of *Wired*, the magazine reflects the perspectives

⁸⁹ Borsook, P. (2000). *Cyberselfish: a Critical Romp Through the Terribly Libertarian Culture of High-Tech*. Public Affairs, a member of the Perseus Books Group, New York, NY,

⁹⁰ *ibid.*

and discourse of the digital design community of practice. In fact, I argue that the shift away from the original hacker counterculture audience to a more mainstream, consumer-oriented audience is a key factor in *Wired* attracting the digital arts community.

What qualities would *Wired* need to exhibit in order to be considered a part of the digital arts Community of Practice? To begin, we would expect to see digital designers speaking within *Wired*. *Wired* would also have to share similar topical and discursive frames as the other sub-Communities of Practice in digital design; i.e., the topics discussed would need to be similar in content, and there would need to be strong evidence of mutual engagement, joint enterprise, and shared repertoire discourse.

First, it is important to address a major difference between groups Cipher Prime and SIGGRAPH and *Wired*. Both Cipher Prime and SIGGRAPH are co-located groups of people whose interactions take place in a physical space in real time, and, traditionally, Communities of Practice are theorized as taking place in a real-time, co-located setting. *Wired*, on the other hand, is a magazine, and the interactions among its members generally take place in isolated time and space—the time that an individual commits to reading the magazine or the articles posted online may be different than other readers, and the discourse within *Wired*, such as the articles and the letter to the editors, are written in separate spaces, edited, and then compiled.

For a growing percentage of Communities of Practice scholars, however, CoPs need not be physically co-located. Scholars like Line Dube, Ann Renninger, and Wesley Shumar argue for the validity of Virtual or Online Communities of Practice, CoPs where members meet with one another via teleconferencing technologies, such as Skype, or CoPs that exist primarily as online groups such as forums.⁹¹ In the case of Skype meetings, community members are still

⁹¹ See Dubé, L., Bourhis, A. & Jacob, R. (2005). The impact of structuring characteristics on the launching of virtual communities of practice. *Journal of Organizational Change Management*, 18(2): 145-166 and Renninger, K. A. and Shumar, W. (2002). *Building Virtual Communities: Learning and Change in*

interacting in real-time and are generally aware of each other's identities, but either a portion or the whole of the CoP are in physically separate places. In forum-based CoPs, it is common for community members to have little knowledge of each other's faces and legal names, and interactions are temporally staggered; real-time back-and-forth posting sessions certainly occur, but are uncommon.

Wired shares some traits in common with a hybrid Virtual Community of Practice. Many authors and editorial submitters are neither co-located nor are they communicating in real-time, although the editorial staff is largely housed in the company's headquarters in San Francisco. The readers of *Wired* interact with its content in various ways—the readers of the online version of *Wired* are able to directly comment on message boards attached to most articles, and are also able to share links to various articles via social media sites like Facebook and Twitter. In fact, many of the designers I spoke with who read *Wired* did not actually subscribe to the magazine or check the website daily, but rather regularly followed links from *Wired* posted from other designers they were connected to through these social networks. There are also, of course, those who access *Wired* through a print subscription.

My argument, however, is not that *Wired* itself is a separate Community of Practice, but rather that *Wired* and its authors are major contributors to the discourse within the digital arts CoP—that *Wired*, SIGGRAPH, Cipher Prime, and other design groups are collectively contributing to a Community of Practice that, like a Virtual Community of Practice, transcends place and co-temporality. While the large majority of the designers who were inquired about *Wired* either read it regularly or read articles linked to them from other designers, that alone does not necessarily mean that *Wired* is a contributor to the Community of Practice. As mentioned earlier, it could be possible that *Wired* plays a role in Geek popular culture, which often overlaps

with the digital arts, and that the presence of *Wired* in the Community is merely a reflection of that. One way to see that that *Wired* is part of the digital design CoP is to demonstrate that the discourse within *Wired* reflects the types of design discourse that was observed in co-located design sites like SIGGRAPH and Cipher Prime, and that the identity of the presumed subject of these articles should be designers. To that end, observe Table 1, which depicts several *Wired* statistics broken down into five-year periods (n=361):

Category	1993- 1997	1998- 2002	2003- 2007	2008- 2012
Article Directly Addresses Designers	51%	30%	31%	24%
Article Author is Male	88%	77%	86%	87%
Article Speaker is a Designer	44%	35%	48%	47%
Article Speaker is Male	80%	95%	91%	92%
Design Community of Practice Talk	67%	51%	61%	49%
Consumer-Oriented Talk	54%	46%	53%	49%
Article Topic: Games	19%	10%	24%	18%
Article Topic: Animation and Visual Effects	19%	14%	19%	14%
Article Topic: Web Design	48%	54%	60%	53%
Article Topic: Other Software Used as a	58%	37%	38%	18%
Tool				
Article Topic: Other Software Used as a	44%	29%	27%	17%
Product				
Article Topic: Art	42%	25%	44%	42%
Article Topic: Biotech	4%	10%	11%	14%

Table 1

What does this data set tell us about *Wired* and the discourse within it? First, the gender demographics of both the authors of each article (who were often journalists or writers) and the primary speakers of articles (the subject of interview within an article, for example) were consistently and overwhelmingly male over time. Authors and speakers who were not male were almost always female; only one out of 361 articles coded listed a transgender author in the byline. On average, 84% of article authors were male, and the average would have been higher if not for a slight, but noticeable, increase in women's authorship in the late 1990s/early 2000s. This bump may be partially explained by *Wired's* new ownership and editorial staff making an effort to appeal to women readers to help keep the magazine afloat during the dot-com bust.⁹² Interestingly enough, there were more women being interviewed during the Rossetto and Metcalfe era than during the more mainstream-ed *Conde Nast* era, 20% to 7%. However, women were still a minor presence in each era. Overall, the demographic dominance of male voices in *Wired* resembles a similar dominance in the digital arts and high-tech industries. The male focus is also seen via *Wired's* covers-- of the 236 magazine covers from 1993 to 2012, only 28 featured women on the cover; five of these women were cartoons, and one was entirely a close up shot of cleavage.



The Women of *Wired*

⁹² Borsook, P.

⁹³ The Women of *Wired*

The data also reveal that a substantial percentage of the intended audience of *Wired* is the design community. On average, the speaker of the article is a designer or digital creative 43% of the time, and they also make up the largest group of speakers; the identities of other speakers are fairly evenly divided among politicians, writers, academics, and businesspeople. A speaker within article was coded as a designer if they were directly involved in the wide variety practical work of a digital medium, like programming a website, planning the combat system in a videogame, or animating a character. Investors and “angel entrepreneurs,” businesspeople who invested in tech and digital arts companies but had no involvement in asset production were not coded as designers. While the large percentage of designers featured within the magazine shows that *Wired* and its audience has an interest and respect for designer discourse and viewpoints, admittedly this alone does not prove *Wired’s* position as a contributor to digital design discourse.

In fact, the data point of articles that address designers would seem to agree with the sentiment that following the purchase of *Wired* by *Conde Nast*, the magazine stopped appealing to those in the tech scene and instead focused on the mainstream consumer audience. The presumed identity of the readership was determined by direct references to the reader's job or identity, or strong indirect practical or social qualifiers that aligned with being a designer. For example, the article “A Pirate’s Life for You,” written by Mary H.K. Choi in the March 2012 issue, discusses the practical considerations designers must face when deciding to move from a salaried job to a full-time freelancer.⁹⁴ Coders labeled this article as having a presumed designer audience because the article is giving direct, practical advice on how to negotiate with clients and handle personal finances within a freelance setting--advice that is most useful for designers. Similarly, the February 1999 article "Improving Your Rep" tells readers to train their

⁹⁴ Choi, M. H. K. (2012). "A Pirate's Life for You." Featured in the March 2012 issue of *Wired*

interpersonal skills as well as their technical skills if they want to succeed in the tech industry.⁹⁵ Again, the article assumes its audience is interested in advancing up the tech industry ladder, a concern mainly held by designers, not consumers or a popular audience.

During the Rossetto and Metcalfe era, 51% of *Wired* articles assumed that part of their readership was the design audience; this was generally easy to code since most of the design audience appealed to was assumed to be within the professional ranks. Historically this makes sense, as few consumers had access to computers and equipment powerful enough to develop commercially viable software and art on, and technical skills were rare. There was little training or support available for those who were interested in digital art and design outside of computer science and engineering collegiate programs, nor was there a widespread cultural experience of computers to draw upon for those who were more casually interested in digital development. Most digital art and design, therefore, was located within professional industries.

While the percentage of articles that explicitly identify their audience as designers decreases over time, there is a relatively stable--and large--percentage of articles that engage in digital design Community of Practice discourse. That is, while comparatively fewer articles are identifying their audience as designers, and, in particular, as professional designers, there were still a large number of articles that discussed the properties of digital design and technology, how to use these properties in order to create, as opposed to consume, and defined "best practices" of digital design. Sixty-seven percent of pre-*Conde Nast Wired* articles contained design discourse, as well as an average of 54% of *Conde Nast Wired* articles. While there is a slight drop off from the early days of *Wired*, slightly over half of the articles use digital design discourse, a percentage that, notably, is greater than the articles that explicitly define their audience as designers during the same time period.

⁹⁵ Wolf, G. (1999). "Improving Your Rep." Featured in the February 1999 issue of *Wired*

What does this design discourse look like, and how can we understand the greater prevalence of digital design discourse in articles than the presence of identifiers for designers? Interestingly enough, the discourse shares qualities with the two types of discourse seen in Communities of Practice: joint enterprise, and shared repertoire.

What does joint enterprise, the discourse that defines the boundaries and domains of the Community of Practice, look like in *Wired*? As indicated by Table 1, statistically *Wired* has a greater focus on web and software design than other forms of digital art, just as CIPHER PRIME has a greater focus on game design and SIGGRAPH has a greater focus on animation. However, game design, animation and visual effects, and "art" (a catch-all code that captured elements such as digital photography, visual installations, and digital music) were all well represented over time. In addition, a small, yet growing, percentage of articles focused on biotechnology and bioengineering, a feature of the design community that will be discussed in Chapter 3.

Joint enterprise comprises the "meta-discourse" of a Community of Practice; in addition to defining the material-practical domain of the CoP, joint enterprise also helps define what the goals of practice within that domain should be. *Wired* reports on and contributes to this talk about practice by voicing and commenting on the design goals of various designers. Consider, for example, the following quote about Google's reasoning behind developing its own browser, Chrome, from the September 2008 issue of *Wired*, written by Steven Levy:

In the coming era of cloud computing, the Web will be much more than just a means of delivering content — it will be a platform in its own right. The problem with revamping existing browsers to accommodate this concept is that they have developed an ecology of add-on extensions (toolbars, RSS readers, etc.) that would be hopelessly disrupted by a radical upgrade. "As a Firefox developer, you love to innovate, but you're always worried that it means in the next version all the extensions will be broken," Fisher says. "And indeed, that's what happens." The conclusion was obvious: Only by building its own software could Google bring the browser into the cloud age and potentially trigger a

spiral of innovation not seen since Microsoft and Netscape one-upped each other almost monthly.⁹⁶

The preceding excerpt defines several goals for web and software designers, as well as prognosticates on the future development environment of web design. Constant and radical innovation, for example, is a design goal unto itself. Levy draws upon the Internet Explorer-Netscape Navigator wars of the mid-1990s as an example of a golden period of competitive innovation; one that kept both the developmental and user experiences of web browsing from growing stale. The article also draws upon the knowledge of a current web developer who talks about the pitfalls to lasting innovation that exist within web development today—specifically, that innovation is discouraged by web platforms that break any modifications made to them every time there is a version update, which is a frequent occurrence.

In addition, the above article paints a picture of the current and future web development landscapes. According to *Wired*, presently the web is an ecosystem of various interconnected software packages, many of which are “hacked” together (an idiom in the digital arts equivalent to “duct taping” something together), so that a slight change in one package can have catastrophic impacts on others that rely on it. The future, however, is the era of cloud computing, where web browsers themselves become experience platforms that draw upon the processing power of remote computers to radically improve user and designer experience. To fully harness this future, designers should not hack in functionality to older web browsers, but rather create a brand new browsing platform that is designed with the potential power of the cloud in mind. Abandon the old software that stifles the future of innovation, and embrace the new. Later in the article, Google helpfully suggests that new platform should be its own, Chrome.

⁹⁶ Levy, S. (2008). "Inside Chrome: The Secret Project to Crush IE and Remake the Web." *Wired*, 9/2008

Like at Cipher Prime and SIGGRAPH, shared repertoire, or the practical talk of how to successfully practice the domain of the CoP, exists less in *Wired* as tutorials and more as identifying best practices and useful techniques to generally apply to the production of digital art and technology. Shared repertoire discourse within *Wired* tends to come from interviews with designers or entrepreneurs who give practical advice from their experiences “in the trenches” of development or offer their perspectives on the current markets and trends that are impacting design. For example, in the following excerpt from November 2001, David Bennaum, an investor/entrepreneur in mobile device design and usability, offers his advice on what types of mobile development will successfully attract investors and customers:

Keep it simple: It doesn't matter if it has a color screen, a 300-MHz processor, removable storage, and a built-in camera - if you talk into it, it's still a telephone. The temptation to overbuild these new mobile platforms is only going to increase as the next generation of larger-screen color handsets sweeps this country. Services that do one thing, and do it simply, will rise above the rest.

Cater to social needs: Mobile media will only increase the use of phones as a social tool. Dating services, which combine sex and communication, will likely become as popular in the US as they are in Japan. Multiplayer games are another area with strong potential.⁹⁷

Bennaum is identifying key properties of what he believes the future of the mobile device market will look like, and giving the reader practical advice on how to best develop to navigate this market. It is important to note that practical design advice can be both technologically centered as well as socially centered—Bennaum, in fact, is more concerned with the human and social dimensions of mobile phones than he is with their hardware specifications. Bennaum’s practical advice also shows some of the difficulties of predicting technology even into the near future—while he was on target about social gaming and dating services being high-growth sectors for mobile platforms, Bennaum’s assertion that mobile

⁹⁷ Bennaum, D. (2001). “Mobile Mantras.” From the November 2001 Issue of *Wired*

devices will always be primarily telephones seems naïve during a time when mobile devices are far more often used for web browsing, game playing, or texting than they are for actual telephone calls.

The other discursive frame within Communities of Practice, mutual engagement, establishes the social connections and norms among the members of the community of practice. This mutual engagement and normative discourse will be discussed at greater length in Chapter 3. I can say here, however, that while there are little to no discursive elements that relate to readers or subscribers of *Wired* socially gathering, there are certainly elements of design discourse which reinforce the techno-libertarian norms and philosophies inherited from Kevin Kelly and Stewart Brand, mixed with some Donna Haraway-esque post-humanism. For *Wired* (and in the digital design community at large), technology wants to liberate and to be liberated, to be unhindered by government intervention, innovation-quenching monopolies, and “backwards” religious norms, and to free us from our shared isolation, our inability to speak truth to power, and from the limits and constraints of our fleshy bodies. The mutual engagement discourse across SIGGRAPH, *Wired*, CIPHER PRIME, and other sites of digital practice also reveals the design community’s desire to have technology be both beautiful and subtle; to be at once so aesthetically pleasing that users and other designers are forced to take notice, and yet so elegant that it seems to blend into nature.

What does this mean for our definition of digital artist and designers?

How can we explain the prevalence of digital design Community of Practice discourse outside of articles that directly refer to professional designers? This finding would seem to provide evidence for the “democratization of design” phenomena that was briefly discussed at the beginning of the chapter. In short, individuals considered to be consumers or non-

professionals are beginning to have access to technology that enables them to create their own digital art. One need only examine sites like Newgrounds and deviantART to see testaments to the surge in amateur creative production in the past decade.

Perhaps more important than the actual media production, however, are the design-oriented discursive frames and epistemic orientations developing within the non-professional ranks. Non-professionals, in other words, are learning to think and communicate as designers.

It is these epistemic and discursive elements that may lead us towards our first step at a practical definition of a digital designer; one that includes artists and designers who are not in the industry but also avoids the tautological trap of labeling as a designer anyone who produces any content on a computer. There is a major difference between using digital tools to produce a piece of digital content and in thinking through the properties and potentials of these tools and how to use them in a user-centered or artistic way.

Although coming from an education perspective, James Paul Gee shows how we can evaluate the role and identity of designers through their discourse. Gee, while examining the role of videogames in education, provides provocative examples of design work and design discourse that originates from outside of the professional community. In his work "What Videogames Have to Teach Us," Gee interviews a 12-year old, "Max," who is using an in-game level editor for one of the *Tony Hawk Pro-Skater* games. The level editor allows for players to use tools to construct their own skate parks, or "maps," which other players can interact with. In the interview, Max talks about how his first map design wasn't very successful because of his reckless overuse of the various tools and functions the level builder offered to him. By overpopulating his map with traps, jumps, hills, and railings, he rendered the level so cluttered that it was virtually unplayable.

His second iteration, Max states, was much more successful because of the learning experiences gained from his first failed level. In his second map, rather than placing elements at random, Max conceives of recreating a physical skate park he had visited using the game engine, and used the tools available--in moderate, creative ways--to construct his best approximation. The end result was a balanced level design that resulted in more *Tony Hawk* players using and enjoying his map. As he has gained experience in map-making, Max now builds levels that feature hidden rooms and passageways that encourage the players of his map to explore. As Gee notes of Max's interview:

...this is producer talk. It's designer talk. Max is developing a rich interpretive system in which to evaluate his design decisions (and does not spare himself from criticism). Max ... is also a producer and insider by the second day he has owned the game—and this is the first time he has made maps.⁹⁸

In Gee's example, Max is learning how to be a better designer by engaging in a process of trial and error with the program and with his potential audience. Max learns the game engine's physics by playing the game and experimenting with level design, and he learns what makes a well-designed level through playtesting his own cluttered design and by feedback gained by sharing his levels with other players online.

During his first map-making endeavor, Max was being creative; he was mixing and matching the various map and terrain elements in a sandbox-style play environment. When making his second map, however, Max was not just playing—he was designing. He had begun to develop a design epistemology, a deep concern not only with using the various tools at his disposal but in deploying them in interesting and meaningful ways. Max began thinking—and talking—about how his users would engage with the environment that he created, how, through his level layouts, he could encourage them to explore his skate parks in specific ways, and guide

⁹⁸ Gee, J.P. (2007). *What Videogames Have to Teach Us About Learning and Literacy*. Palgrave-Macmillan

them towards new parts of the level. Max, in other words, was thinking both about the material-technological properties of the system he was creating but also about how to give the human users of his system the best experience possible. The focus on human need echoes the definition of design quoted from the Design Council at the beginning of the chapter—that design is about making things better for people; even if those things are virtual skate parks.

In a somewhat ironic twist, the decision of *Wired* to focus more on a popular, mainstream audience instead of a niche market of professional designers actually expanded the amount of designers who are impacted by *Wired's* discourse. While professional designers are able to engage in CoP discourse at their place of work or through industry communications, non-professionals must look elsewhere. For many, *Wired*, is one of those sources.

Wired's role in the digital arts Community of Practice is to disseminate design epistemology, ontology, and discourse across a broader spectrum of population than co-located communities like Cipher Prime and SIGGRAPH can. Like Cipher Prime and SIGGRAPH, *Wired's* population includes both professionals and amateurs. By reading *Wired*, designers are able to follow industry and market trends, gain access to conversations at elite digital creative arts institutions like Pixar and Dreamworks, and gain knowledge of resources to help build their practical skills sets. *Wired* reinforces the domain diversity of the digital arts CoP by highlighting and connecting various practical sub-domains, such as game design, web design, and VFX. By catering to both professionals and amateurs, *Wired* reinforces the diversity of skills and experience within the design community. It positions designers as both producers and consumers of technology, and publishes articles that appeal to each aspect of that dual identity. *Wired* also often reinforces the lack of gender and ethnic diversity within the CoP, and often advertises white (and sometimes Asian) men as the primary contributors to tech and digital arts fields.

Most importantly, however, *Wired* teaches designers *how to think like designers*. It teaches its audience to think about both the properties of technology and about the humans who will be using it. It teaches them (for better or for worse) the techno-libertarian values that pervade large segments of the community. It teaches them to *think and observe*, and not just *play*, and in so doing helps mold a community of thoughtful practitioners. It molds design.

Chapter 2 – The Ontic and the Epistemic

"There's a world of difference between what we see, and what is." -Elizabeth⁹⁹

I'm playing *Bioshock Infinite*, an action-RPG video game developed by Irrational Games, and playing the part of Booker DeWitt, the player-character. I'm hurrying down a dark corridor inside of a maze-like building, my assault rifle clenched high and tight against my chest. Around me are the ambient sounds of the machinery and gears that keep this whole city floating 20,000 feet above the ground, punctuated by the hard cracks of our leather boots meeting the rusted iron floor as we run. We had managed to "clear out" a group of the armed men who were following us, but there's no telling how much time we have before more of them catch up. We make a right turn down a hallway. Steel double-doors. Locked. I curse under my breath.

"Booker," Elizabeth says to me, her blue eyes glancing to a small crack just beneath the door handle. "Here, let me." She extends her hand. I toss her one of the lock-picking sets that I had grabbed off a fallen foe earlier. She's better at picking through doors than I am. She brushes a lock of auburn hair out of her face and bites her bottom lip as she sets to work. I turn my back to her and aim my rifle down the hallway, checking for any signs that we had been followed.

Seconds later, I hear giddy excitement in her voice. "Done!"

I take point, ready my rifle, and kick open the now-unlocked door. The darkness of the building is replaced by the blinding light of the sun, and the walls of the hallway give way to open sky. Wind blusters around us as we make our way onto the platform outside. Now all we

⁹⁹ Elizabeth from *Bioshock Infinite*, c. 2013 Irrational Games, published by 2K Interactive

need to do is find the nearest Sky-Line, the metal threads that connect the various islands of this floating city, and ride it to safety.

A bullet clangs off the crate next to me. "There he is!" shouts a gruff voice, and four men stream out of another exit onto the platform. Elizabeth and I split and find cover behind two conveniently located concrete half-walls. I stand and return fire; my shot knocks one man off his feet and off the platform, sending him hurtling towards the ground below. Two thugs take advantage of my temporary exposure--their bullets rip through my shield and find a home in my left arm. I cringe and retreat back behind the concrete.

"Booker, catch!" I hear Elizabeth yell. With a small flash of light a bottle of healing potion appears in her hand. She tosses it to me across the battlefield, and the wounds in my arm disappear as the liquid drains down my throat. I know that summoning items from across dimensions takes a lot out of her; I'll have to buy her a few moments of recovery time. I motion my now-healed arm at two of the men. Black feathers sprout throughout my limb and fly into the air--where they turn into crows. The crows descend upon the thugs, pecking and clawing at their faces. While they're distracted, I fire. I don't miss.

I glance at Elizabeth. She's recovered. The last man has dug himself in deep behind a stack of crates; I'll have to go in closer in order to end this. I make a beeline towards the last foe.

His eyes widen when he sees me break cover and expose myself in what appears to be a suicide charge. He leans out with his rifle and prepares to fire. Now we've got him.

As he pulls the trigger, blue energy flashes in front of me, and a turret falls out of midair and hits the platform with a loud crash. His bullets bounce off the turret, which returns the favor. Bullets don't bounce off the man.

Threat eliminated, I scan behind me for Elizabeth. She stumbles out of cover, clearly exhausted. Pulling a turret through space and time is a bit more complex than giving me a health potion. She recovers quickly and smiles at me. We dash to the edge of the platform and finally find the Sky-Line. We leap and hook onto the silvery thread, and disappear into the clouds.

The story of *BioShock Infinite* largely centers around the interactions of Booker DeWitt, a gun and magic-wielding mercenary, and Elizabeth, speaker of the epigraph at the beginning of the chapter, a mysterious girl who has been locked in a tower her whole life, and who possesses the ability to use powerful inter-dimensional sorceries. The gameplay is reflective of the story--Booker and Elizabeth each have unique powers and abilities, each of which must be utilized in conjunction with one another in order to successfully navigate through the game.

A key gameplay element, however, is that whereas Booker is a playable character, Elizabeth is not. The player has full control over Booker's actions--his combat advancement, his adventuring, and his

storyline choices--whereas Elizabeth operates as a largely autonomous figure.

While players are able to prompt Elizabeth to take certain actions, such as



Figure 3: Elizabeth From BioShock Infinite

asking her to pick locks or summon cover

for Booker in combat, Elizabeth is also a highly independent contributor to the experience of the game. As described in the above narrative, Elizabeth will heal or attempt to restore the player's

magical abilities without prompting, and will also point out gameplay elements to the player, such as the presence of pickable locks or hidden treasure. However, Elizabeth's AI goes beyond simple scripted combat or puzzle events. She explores the game world alongside and yet independently of the player; while Booker may be looking to buy weapons or ammunition from a street vendor, Elizabeth may be smelling the flowers that are growing next to the vendor's cart, or dancing to street music being played a few feet away.

These events are not simple-scripted. Elizabeth will not repeat the same behavior over and over again every time a player visits the same area, or even on subsequent playthroughs. Instead, Elizabeth has a wide variety of possible logics that she may apply to any given situation, and the logics chosen are determined by her previous experiences in the game world, Booker's interactions with the game world, and Elizabeth's interactions with Booker. In order to be a successful partner, Elizabeth must anticipate and predict the player's behavior. Similarly, in order to succeed the player must learn to anticipate and predict Elizabeth's actions, particularly in the game's higher difficulty settings where combat is much less forgiving. Gameplay, in other words, is heavily impacted by the dialectic between what Elizabeth is thinking and what the *player thinks* Elizabeth is thinking, and between what the player thinks and what *Elizabeth thinks* the player is thinking.

Elizabeth and the player play the game together. They each impact each other's decision making and gameplay processes. They each learn about the game world in unique ways. The gameplay and narrative experience of *Bioshock Infinite* is largely a negotiated one between the player and Elizabeth.

The experience of playing *Bioshock Infinite* with Elizabeth is a metaphor. She serves to help problematize post-positivist confluences of epistemology and ontology. What Elizabeth

thinks and what the player thinks Elizabeth thinks are not necessarily the same thing, and incorrect assumptions by the player can quickly lead to the player's death. There is, in other words, an objective reality to the gameworld that the player can interpret incorrectly. Elizabeth also interacts and is impacted by the objective reality of the game. Elizabeth and the player are constantly discovering properties about one another, one another's behavior, and the game world. This process of discovery of objective features of the world and others in it is largely reflected in the discourse of digital designers. This discourse, I will argue, is largely ontological.

In addition, Elizabeth and her impacts on both the player and the gameworld of *Bioshock Infinite* also serve as a metaphor for the causal and discursive impacts that technology has on digital artists and designers. In this chapter I will argue that the material and logical properties of technology have causal impacts on design processes and outcomes. These causal impacts are actually more powerful and nuanced than theorists like Bruno Latour account for via the "agency via resistance" models within Actor-Network Theory.¹⁰⁰ Rather, I will argue, based on observations and analysis of the ontological discourse of designers, that the hardware and software that digital designers engage with are not tools with agency, but are, in fact, co-constructors of meaning in design. Digital design, in other words, is a practice whose products and meaningfulness are the results of negotiations among humans and machines.

What is ontology?

In order to explore issues about how the material and non-human worlds impact the design process, it is necessary to engage in ontological talk. Ontology is a tricky concept in contemporary social science. On the one hand, theory that concerns itself with making claims about the way the world *is*, as opposed to how the world is *perceived* or *constructed*, in particular by human beings, has largely receded from the analytic toolkit. This recession and its

¹⁰⁰ Latour, B. (2007). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford

post-Kantian tradition was discussed in the introduction to this dissertation. On the other hand, as a term, "ontology" is seemingly coming back into vogue, largely because of a refocusing of the analytic lens in social and critical theory upon non-human actants, such as physical objects in Actor-Network Theory, or the interplay of body and technology in cyborg theory.

Anthropologist Eduardo Kohn, a proponent of multi-species ethnography, sums up the state of "ontology" in the social sciences thusly:

As a recent debate makes clear, ontology, as it circulates in our discipline, is a thorny term. On the one hand, it is often negatively associated with a search for ultimate truth--the kinds that the ethnographic documentation of so many different ways of doing and seeing is so good at debunking. On the other hand, it sometimes seems to function as nothing more than a trendy word for culture, especially when a possessive pronoun precedes it: *our* ontology, say, versus *theirs*.¹⁰¹

Although Kohn is right to talk of the return to ontology, he himself keeps us from it.

Kohn posits that the solution to the conflation of culture and ontology is to invoke the "multiple realities" or "multiple worlds," a model also used by Science and Technology Studies scholars like Karin Knorr Cetina and Bruno Latour. Under this social constructivist model, social groups construct their own ontologies, or understandings of the world, which may vary from one another.¹⁰² The problem is that these held ontologies are then conflated with the objective ontological realities that each group inhabits. For example, constructivists would hold that two adjacent neighborhoods within one city each exist within their own socially constructed worlds. Similarly, that even different professions exist within different worlds. Knorr Cetina, for example, holds that microbiologists and theoretical physicists exist in different worlds because of the differences in their subject of study, their methods of study, and the material scale of

¹⁰¹ Kohn, E. (2013). *How Forests Think: Toward and Anthropology Beyond the Human*. University of California Press. page 10; in this quote Kohn cites Venkatesan et. al. 2010, Carrithers 2010, and Holobraad 2010

¹⁰² *Ibid.*

their study.¹⁰³ For Knorr Cetina, microbiologists live in a world characterized by smallness, and inhabited by cells and microscopes. Theoretical physicists live in a world characterized by time and space, and inhabited by particles and mathematical equations.

The idea that cultures and individuals each have their own ontologies or pictures of the world is hardly problematic in of itself. Cultures, societies, communities, and professions certainly do have their own understandings about what exists in the world and how the world works. These understandings are ontologies. Different cultures also have their own epistemologies, or ways of knowing how they know what they think they know of the world. Fundamentalist Christians and Evolutionary Biologists, for example, make very different claims from one another about how humans came to exist on Earth and what constitutes the valid evidence for saying so. Even the constructivist model that cultures construct their own worlds is itself making a reality claim about the world, and is therefore an ontology.

The problem with the "multiple worlds" constructivist model of ontology is it disables any distinction between a group's held ontology and the world as it actually objectively is. This is because the constructivist model of ontology either conflates the properties of the objective, external world and their impacts with the way human beings understand and think about the world or uses cultural ontologies to sidestep talking about objective reality. Thus, under the constructivist model it must be simultaneously true that Fundamentalist Christians live in a world where God brought humanity into existence in seven days whereas biologists live in a world where humans evolved over millions of years from pre-existing forms of life. For constructivists, these different systems of making sense of the world, or "worlding," to use the

¹⁰³ Knorr Cetina, K. 1999. *Epistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press

term from the practice turn in sociology, actually are separate worlds that these groups inhabit.¹⁰⁴

Is that really what we want to say? That Fundamentalists and biologists inhabit separate worlds? It is not true that they inhabit a single common world but have different ideas about what that world is? Each group may have their own ontologies, their own understandings and claims about the world, but these claims can be *righter* or *wronger*. A living being's claims about the world do not create the material world. They can add to the world, and claims can be real. Claims and value judgments about the world may certainly influence causal chains that impact the world; simply look at the impact on the environment that economic policies that deny the validity of anthropomorphic global warming have. But global warming is either *happening* or it *isn't*, and humans are either *impacting it* or they're *not*. The ontology argued above aligns closely with philosophical realism--the world in of itself is real, independent of human interpretation.

Why does this all matter? It matters because non-humans have just as much of an impact on humans and social life as humans and society have on non-humans. By accepting the axiomatic claim that the world is what sets of humans understand the world to be, social scientists analytically limit ourselves to making claims about what living beings *perceive* and *understand*, and lose the ability to comment on what *is*. This is not to say that understanding and meaning are not important--they are tremendously so, and this dissertation will delve into meaning more deeply in this chapter and the next. I will also not argue that nothing is socially constructed, nor that communities are not socially constructed. I am going to argue, however, that meaning is important, but not imbued into objects by humans, that not all processes in which humans interact can be fully explained by or understood via social construction, and that

¹⁰⁴ Kenner, A. (forthcoming) "Asthma and Environmental Prosthetics"

non-humans engage with humans in both the design process and the meaning-making within the design process.

Let us return to Elizabeth from *Bioshock Infinite*. According to the constructivist perspective, what players can interact with is their mental map of Elizabeth's behavior, what the player *thinks* her behavior is driven by. The player's ludonarrative of Elizabeth--their understanding and reification of the game experience of interacting with her--is therefore an internal and individual one, unique to each player.

From the constructivist perspective then, Elizabeth only exists as each player perceives her to exist, and is defined by the player's understanding of her and her actions. However, what Elizabeth actually "thinks," how she operates, is an objective property of the game regardless of the player's own opinions, and Elizabeth impacts gameplay and the gameworld independently of the player's understanding of her impacts and the logical reasoning behind them. The player's understanding of Elizabeth and the gameworld can also be *righter* or *wronger*, and the rightness or wrongness of the player's understandings will benefit or punish the players as they play through the game.

Given this, how can we as analysts understand Elizabeth's position within the game and her relationship with the player outside of a constructivist ontology? Elizabeth is at once both a designed part of the game as well as a user of the game; she is a part of the gameworld and yet (and thus) uses the same types of physics engines and navigational positioning systems as the human player to interact with other objects in the game. She advances through the game alongside and yet independently of the player; she remembers what she has interacted with in the past, and she finds new objects to interact with as she and the player explore. Importantly, she impacts both the player's gameplay and the player's *understanding* of gameplay.

Actor-network theorists would label Elizabeth an agent, a co-actor who, alongside the player, other in-game systems, and the game hardware, contributes to the network of the game. That recognition of a causal network connecting human and machine agents is an important insight. Equally important is Latour's recognition that in this claim we are speaking of ontology and not epistemology.¹⁰⁵

Yet, in spite of his desire to talk about heterogeneous networks of humans and objects, Latour undermines himself by attributing agency to objects. That attribution is not quite right. Giving non-living things agency is a slippery slope, one that can lead to contemplating objects as "humans-that-are-not-quite-human," an analytical model that both clouds the unique nature of non-living objects and homogenizes the heterogeneous network. Elizabeth is human-like in that she contains a graphical representation of a human-like body, and a simulation of emotion and consciousness; but she does not have a human body, nor consciousness. To ascribe conscious agency to her is to both give Elizabeth properties she doesn't possess and to circumvent talking about the ways Elizabeth interprets the gameworld that are unique and decidedly non-human.

What Latour means by ascribing agency to objects is that they are *causal actants*. They have what Roy Bhaskar calls causal powers, or the powers or capacities of an object or an actant to influence other actants and events.¹⁰⁶ Something can have causal powers or be in that sense a causal agent without being an intentional agent like humans. Humans and non-humans act differently. Thus, Elizabeth may be better understood as being a causal actant upon the gameworld and gameplay. Elizabeth's actions have causal effects within *Bioshock Infinite* and on the player, whose actions also have causal effects within the game and on Elizabeth. In addition, the gameworld, game mechanics, and rule set have causal effects on Elizabeth and the

¹⁰⁵ Latour, B. (2007)

¹⁰⁶ Bhaskar, R. (1998). *A Realist Theory of Science*. Routledge

player. All of the actants within the network of engagement with the game possess what causal powers.

In the end, it is perhaps better to say that Elizabeth, *Bioshock Infinite*, and the player exist then not as parts of an Actor-Network, but as parts of a *causal network*: a series of nodes and nodal connections, agents and actants and assemblages, and the properties and qualities thereof; all of which (and whom) exert causal force upon one another.

The causal powers of Elizabeth and the player, and their impacts on the gameworld of *Bioshock Infinite* bring up interesting philosophical questions and analytical complexities. Moreover, these philosophical insights serve as a gateway to a causal and ontological analysis of the digital design Community of Practice. How do the causal powers of hardware, software, and the human designer interact to form the process, practice, and meaning of digital design? As Lev Manovich notes of humanists and social scientists attempting to study digital cultural production:

We lack not only a conceptual history of media editing software but also systematic investigation of *the roles of software in media production*. For instance, how did the adoption of the popular animation and compositing application After Effects in the 1990s reshape the language of moving images? How did the adoption of Alias, Maya, and other 3D packages by architectural students and young architects in the same decade similarly influence the language of architecture? What about the co-evolution of Web-design tools and the aesthetics of websites--from bare-bones HTML in 1994 to visually rich Flash-driven sites five year later, and responsive web design in the early 2010s?¹⁰⁷

What Manovich is calling for is an investigation into both the properties of media editing and generative software, and the impact of their causal powers upon artists and designers. Manovich's ontological claims are implying that not only did creative software change the outcomes of the digital design process (Web design tools are affecting and changing alongside the aesthetics of web design), but also that software changed the way humans *talked about* and

¹⁰⁷ Manovich, L. (2013) *Software Takes Command*. Page 41-42

thought about the design process (After Effects changed the language of moving images, Maya changed the language of architecture). Similar to James Gibson's notions of affordances, the objective properties of the technology itself assert power on the users of the technology; in effect, the interpretation and use of technology is not solely the domain of humans, but is partially impacted by technology.¹⁰⁸ To talk of these material properties of technology may seem mundane or even banal, but, as we will see, these properties have tremendous causal weight within the digital design community.

How can software and hardware contribute to the interpretation of technology? In other words, can computers help make meaning? Meaning-making is how individuals and groups interpret and "make sense" of their experiences and the world.¹⁰⁹ Meaning-making is also classically understood as something that only humans can engage in; i.e., humans create subjective value judgments and generate "meaningfulness" about the world and its occupants both individually and in groups via social construction. For Communities of Practice theorist Etienne Wenger, meaning-making is a central part of the educational and practical work that CoP members engage in. Recent scholarship like Eduardo Kohn's has extended the capacity for meaning-making to all living "selves", from non-human animals to trees, but even Kohn's work bounds interpretation and construction of meaning to biological life.¹¹⁰ Can non-human lifeforms engage in meaning-making? If so, can they also be members of a Community of Practice? Can technology?

Again, consider Elizabeth from *Bioshock* as an exploratory gateway. I have already argued that Elizabeth is an actant within the gameworld and exerts causal force upon the game

¹⁰⁸ Gibson, J. (1977). "The Theory of Affordances". In *Perceiving, Acting, and Knowing*, edited by Robert Shaw and John Bransford

¹⁰⁹ Lave and Wenger, CoPs; Igelzi, M. (2000) "Meaning-Making in the Learning and Teaching Process." Featured in *New Directions for Teaching and Learning*, Issue 82, Jossey-Bass Publishers

¹¹⁰ Kohn, E. (2013) *How Forests Think: Toward an Anthropology beyond the Human*.

system and upon the player. Outside of their causal relationship, does the player have a social relationship with Elizabeth? Are the player and Elizabeth members in the Community of Practice of the game?

Elizabeth and the player must work with one another to achieve a collective good-- survival in combat and the completion of the game.¹¹¹ The player's reasoning for completing the game (desire, fun, boredom, etc.) and Elizabeth's reasoning for completing the game (scripts and pathfinding algorithms guiding her ever onward towards the end of the level) are different. Both Elizabeth and the player share a similar practical domain, they each are learning about the game world through their experiences with it, although the player learns about the game world by creating a mental map or connecting neurons to each other, or both (pick your poison between cognitive psychology and neuroscience), while Elizabeth learns about the game by storing new variables about her experience in an array within computer memory, or by toggling "on-off" switches within her intelligence programming to chronicle what objects she has interacted with, and which she hasn't. Remember, Elizabeth is not a human. However, both the player's and Elizabeth's future experience with the game will change based upon their previous gameworld interactions.

Both Elizabeth and the player learn to play the game better and help each other play the game better. Elizabeth provides the player with suggestions and mini-tutorials throughout the game, and the player prompts Elizabeth to take actions in and out of combat. As the player advances through the game, his combat and navigational strategies evolve, and he unlocks new powers and abilities to use in combat, and he learns how to better use and partner with Elizabeth in combat. As Elizabeth advances through the game, more of her powers and abilities

¹¹¹ Although players of the game will know that completion of the game is not necessarily a good thing for the player, the player's character, or Elizabeth!

are made available to her and to the player by the game engine, and her role in combat and the game's narrative change to reflect her evolution.

In addition, player discourse refers to Elizabeth as a person; players treat Elizabeth as though she is a self, a fellow participant in their gameplay.¹¹² Under Martin Buber's *Ich-Du/Ich-Es* ("I-You"/"I-It") model of dialogical existence, the relationship between the player and Elizabeth can be categorized as *Ich-Du*; the player refers to Elizabeth as a "you" entity rather than an "it" entity.¹¹³ Player discourse represents Elizabeth as gendered (we call her a "her"), as possessing emotions, as being more or less helpful during combat, as having a personal history outside of the player's experience of her during the game. The relationship is an intimate one, one between persons, and one that we might expect to find in a community.¹¹⁴

Can technology and software play a similar role for digital designers that Elizabeth does for *Bioshock Infinite* players? In *Epistemic Cultures*, Knorr Cetina finds that scientists in physics labs tend to construct human-like personalities for the various detectors used in simulation building, and often frame their work with them as though they were interacting with friends (and for troublesome detectors, enemies).¹¹⁵ Here, scientist discourse would seem to indicate that they do perceive the instruments as *Du* entities, as co-creators in the production of knowledge. We see similar discourse in the digital design community. Importantly, hardware, software, and digital characters are not the only entities that are discursively represented via

¹¹² See various reviews and strategy guides for *Bioshock Infinite*, all of whom refer to Elizabeth as a "her." Even reviews and analyses that are critical of her agentic vitality, such as Austin Walker's "This is Not an Agent," undermine themselves by referring to an anthropomorphized character, and admitting that she had an emotional impact upon them during gameplay.

¹¹³ Buber, M. (1925) *Ich-Du*

¹¹⁴ The weight of this intimacy is why Buber uses the German intimate form of second-person address of "*Du*" as opposed to the formalized "*Sie*." English references of Buber's work tend to use "Thou" because of the earlier translation of *Ich-Du* by Ronald Smith, where *Du* became "Thou", as opposed to the arguably more spiritually correct, later translation by Walter Kaufmann, that uses "You."

¹¹⁵ Knorr Cetina, K. (1999)

Du. Ideas can be as well. This finding and its implications will be discussed at depth in chapter 3.

Is all this just technological determinism? Technological determinism suggests some sort of inevitability about the use of technology; that technology *determines* its own uses. What the ontological framework posited in this dissertation contends is that technology has properties and causal powers that afford and constrain the way that technology is used, and that these qualities and causal potentials contribute to the negotiation of the constructed meaning surrounding that technology. The "causality" of causal powers is not law-like in a Humean sense, where continuous, repeated observations of "A, then B" within a closed system leads the viewer to infer the causal law "if A, then B." The world is not a closed system. Causal powers with a causal network, then, are not a system of law-like relationships but rather a system whose actants have causal influences on one another. The same technology located within two different social systems would create different effects. Those effects are neither wholly determined by the technology nor wholly determined by the social system. We can see evidence of these causal effects in the ontic discourse of the digital design community.

Ontic Talk

In this chapter I argue that while digital designers do exhibit some epistemological talk in their discourse, digital design talk is largely dominated by ontological claims about the properties of technology and the world and their effects. The goal of analyzing this talk is to make two ontological points: First, that digital designers do in fact talk ontologically, i.e., there is no question in their discourse of *how they know* the properties of technology; rather, they make claims about the properties and causal powers of the technology. Following this, my second claim is that technology and the world do in fact have objective properties, and these properties have causal effects on digital design. I argue for this ontology on the basis of an epistemological

point: that the best way to make sense of digital design discourse giving credit to hardware and software as co-developers and co-constructors of digital design is to accept these claims as being true to the world. This is in a way a kind of transcendental argument made by Roy Bhaskar and the Critical Realists.¹¹⁶ As defined by Levi Bryant, transcendental questions are "questions about what renders a particular practice or activity *possible*. Transcendental questions are questions of what a particular practice *requires* to take place and refer to what is immanent to these practices.¹¹⁷" By using transcendental reasoning, social scientists can evaluate objects *qua* their properties and capacities in addition to evaluating objects *qua* our knowledge of them.

What all this means is that in order to understand the process of digital design, analysts must adopt a realist ontology that accounts for the vitality and power inherent in the material components that digital designers engage with. Design talk is ontic talk. A key practical component to the design process and to digital design discourse is the evaluation of the objective properties of the tools with which designers create and the physical environment in which we all live. It is important for digital designers to understand the constraints and capabilities of the hardware and software that impacts their work, and, especially in the case of animators and game designers, for designers to understand the physical and phenomenological properties of environments that they attempt to mimic or re-create.

It is obvious enough to say that the tools of design impact the way that designers work. Sketching a rough layout of a web page using pencil and paper is quite a different experience than using computer-assisted drafting tools like Photoshop or Illustrator when brainstorming. We must be careful, however, to treat these digital objects--programs, algorithms, engines,

¹¹⁶ Porpora, D. "What is Truth?"

¹¹⁷ Bryant, 43

even monitors and screens--not as intermediaries, but as mediators.¹¹⁸ As Bruno Latour argues, an intermediary is a transporter of elements, whether ideas, objects, or power, that moves them wholesale and unchanged. A mediator, on the other hand, changes the elements it carries. The same designer using a sketch pad or Photoshop will inevitably create a different layout for the page they are designing; the pencil-and-paper and mouse-and-keyboard interfaces have different properties that have different causal powers, that afford and constrain the designer in different ways, and impact the end result. Drawing on Photoshop is not "pencil drawing, but easier." The tool contributes to the creative work alongside of the designer using it.

When the discourse of digital designers reflects upon the properties of technology and the world around them, as well as those impacts, they talk about the way the world is, and the way the world works. In doing so, they engage in a process of discovery of the properties and affordances of the real and material worlds. Designers talk ontologically. They think ontologically. They are an ontic community.

Observe the following table, which details the percentage of articles that contain discourse about the properties of technology as charted from the *corpus* of *Wired*:

Wired Property Talk by Year (Table 2.1)

Evaluation of the Properties of Technology	1993-1997	1998-2002	2003-2007	2008-2012
Properties Impacting the Design Process	77%	59%	70%	58%
Properties as a Consumer Product	63%	58%	60%	62%
Properties as an Agent of Social Change	47%	33%	38%	27%

n=360 articles, 90 per five-year range

¹¹⁸ See Latour, B. *Reassembling the Social* and Manovich, L. (2013) *Software Takes Command*

The category “Properties Impacting the Design Process” shows the presence of articles that contain discourse that discusses how the material affordances or properties of technology or the material world impact the practice of designing. “Properties as a Consumer Product” codifies articles that talk about properties of technology that would be most important to consumers, such as style and price. “Properties as an Agent of Social Change” codifies articles that discuss the impact that the properties of designed technology may have upon society and culture at large.

Before examining the individual categories of ontological discourse specifically, it is important to see the general trends evident in digital design discourse, even in places like *Wired* that, as examined in the previous chapter, represent the amateur designer more heavily than designers in the industry. With the exception of the "Properties as an Agent of Social Change" category, over half, and often over two-thirds, of *Wired* articles discuss the affordances and constraints that technology allows and imposes upon creatives, consumers, and the design process. Designers are not only talking about the properties of technology, but they are also acknowledging digital technology's important presence within the causal network of design. The "Social Change" category, while occupying a smaller percentage of discourse than other types of ontological talk, is still strongly represented, being present in almost half of the articles in *Wired's* early run and over a quarter of the articles from 2008-2012.

What does this type of ontological talk look like, and how can we as analysts understand it? Articles that included discourse about the properties of technology as it relates to creative work accounted for 66% of the 360 *Wired* articles coded. This type of talk was also substantially present at both SIGGRAPH and Cipher Prime. The presence of this type of talk makes sense if we conceptualize the digital arts and design community as a Community of Practice; if the tools that designers and artists engage with in their practical work have strong impacts on the way

that they go about their work and think about their work, we would expect those impacts to be represented in their discourse.

Hardware

The tools that exist within the design causal network and occupy design discourse come in a variety of forms. First there are the physical components of computers and other electronic devices themselves--hardware. The article "The Digital Devolution" by Alec Hanley Bemis from the July 2005 issue of *Wired* discusses the possibilities that digital recording equipment open up for music production, but largely focuses on the new constraints and problems that the properties of digital recording devices introduce. For example:

Digitally recorded, produced, and distributed music suffers sonic degradation at every step, meaning the new wave you listened to in 1981 might actually have sounded better than the nu-metal of today. Here's why: ... Studios used to record onto analog tape, which captures the continuous sonic stream you hear live. Most of today's digital recordings are made at 44.1 kHz, meaning the sound is cut into 44,100 slices per second. That's a narrow slice, but one that can introduce errors detectable by the human ear. Traditionalists record to reels, then dump the contents onto computers, but even this may soon end... [Sound cards] convert the digital data from audio files into the analog signals your speakers translate into sound. Unfortunately, the inside of a PC is a loud place; sound cards pick up noise from the mechanical whirs, clicks, and hiccups your computer makes -and deliver that interference right along with the music.¹¹⁹

Bemis is making claims about the properties of digital recording hardware, digital recording software and algorithms, the products of digital and analog sound design, and the human body. PCs have "whirs, clicks, and hiccups" and digital recording no longer requiring analog tape. Recording software captures information at 44.1 kHz, which, while being a "narrow slice" of the sound wave, can still have irregularities that the properties of the human ear allow it to detect. Audio recordings in 1981 may sound better than audio recordings today--Bemis is making an objective claim about the quality of sound, as opposed to a subjective claim about

¹¹⁹ Bemis, A.H. (2005). "The Digital Devolution." Published in the July 2005 issue of *Wired*

the value of the music. These real properties, in other words, have an independent existence of the humans who use and perceive them.

Anything real, like properties of objects, can have an impact. In addition, the properties of the input devices--the microphones and recording equipment--the processing devices--the body of the computer itself--and the output devices--the sound card--all have an impact on both the creative process that the designer undergoes and the produced media that the user hears (via, in general, the properties of their ears). The digital audio artists must be aware of all of the properties of each of these components when deciding which technologies to use when recording and processing sound, and what sonic corruptions to listen for to clean up when processing the sound files. The digital design process of recording, editing, and producing music is a negotiated one among the causal effects of the properties of sound, technology, the designer, and the listener's needs.

Similarly, the introduction of new interface hardware like the Wacom Cintiq can moderately change the designer's workflow. The Cintiq is a pen-based touch screen tablet display that replaces a desktop monitor, and allows the user to interact with elements on the screen by touching them with a pen-tool instead of using a mouse. The portability and customizability of the Cintiq allows it to be connected to media-production focused computer configurations, which generally feature specialized hardware that is much more powerful than the hardware most consumers would have access to. The pen tool both affords the artist the ability to apply more fine motor control to the manipulation of digital objects on the screen, which also offering a level of precision that finger and gesture-based touch screens tend to lack. Speakers at the SIGGRAPH Keynote address agreed that the Cintiq has radically changed the animation process by affording both creative and artistic precision as well as introducing variability into the storyboarding process. Animators generally prefer to sketch out storyboards

by hand because of the comparative ease and freedom of movement that pen-and-paper give compared to drawing with a mouse; with the Cintiq, however, animators can interact with a computer screen more similarly to how they interact with a piece of paper.

Use of the Cintiq and other Wacom pen-interface devices have greatly increased in popularity since the mid-2000s, especially in the professional digital illustration, photography, web design, and animation industries. The Cintiq is a fairly expensive piece of equipment, the 24-inch version is currently priced at \$3000, so few amateurs I encountered had one, and most schools and professional studios had only one or two, if any. In digital design arts that are largely two-dimensional, like illustration and web-design, the Cintiq is most commonly used by the more art-focused members of the team, who generally do their layout and design on pen and paper, an interface style the Cintiq replicates well. 3D animators told me that Cintiq modelers are joked to be the office hipsters--three-dimensional interactions via a pen interface are substantially different than they are via a mouse and keyboard, and once artists re-learn how to model and animate with a Cintiq, they often refuse to, or at least whine about, making a reverse switch. Not only does the Cintiq impact the material design practice, it can also create a mild class war within studios; the Cintiq-ers and the non Cintiq-ers. The Cintiq also contributes to a variety of shared repertoires within the digital design CoP--the same domain, digital animation, but different styles of practice. Again, this discourse is ontological: it is making claims about both the properties of the Cintiq and also the properties of Cintiq users.

Not all changes to design practice influenced by the properties of hardware are user-interface changes. The "guts" of computer systems, such as a processor in a gaming system, can contribute to Community-wide divides. Ken Levine, co-founder of Irrational Games, and Lead Creator for the aforementioned *Bioshock Infinite*, described the large impact on the design process that game console systems hardware has on the production process. When asked in a

March 2013 interview about the potential of the new generation of gaming systems (referring to the Playstation 4 and the XBOX One), Levine says:

Obviously, more memory, more power is always a good thing. I love the fact that Sony's architecture is now much more aligned with the architecture of the other [consoles], the PCs and [the XBOX]... That will make life a lot better for gamers because you won't have that sort of diversification of resources [of developers] in the same way that you have to do to support the differences in the platforms. I don't mean the [Playstation] Move versus the [XBOX] Kinect, I mean specifically the architecture underneath. So that's a positive.¹²⁰

Levine covers two important points during his interview. First, Levine talks about the impact that pure system power, the amount of calculations that the various processors inside of a gaming system can perform per minute, can have on the design process and the final game outcome. More processing power allows game developers to have more elements within the game occur at the same time, which allows for bigger, more detailed, and more diverse game worlds.

Second, Levine talks not about the power that gaming systems have, but the *way that they process* that power, otherwise known as the system architecture. The Playstation 3's (PS3) architecture was infamously centered around Sony's "Cell Processor," a unique central processor that combined one powerful main processing unit with eight smaller, peripheral processing units on a single chip. The combination of a core and peripheral processors was designed to allow for the Cell to process simultaneous computations at an enormously fast rate, giving the PS3 (and other Cell-powered devices) the ability to process multiple complex data streams at the same time. While because of the Cell the PS3 was arguably more powerful than its completion, the PC and the XBOX 360, which used traditional-style processors, programming for Cell processing was substantially different than programming for traditional processors.

¹²⁰ Quote taken from an interview conducted by Kevin VanOrd from "The Break Room," published on Youtube by Gamespot on March 20, 2013. The Interview is titled "We Can Kill the Industry With Cynicism - Ken Levine - Bioshock" Last accessed March 3, 2014 at (<http://www.youtube.com/watch?v=JwsjALh2vYA>)

The difference in system architecture meant that not only did game developers have to re-learn how to optimize and program their games, they also had to have two different sets of programmers working on the same titles--one set building the game for XBOX and the PC and the other set building for the PS3. This radically impacted the game design process--companies had to decide between pulling their programmers away from other areas of development where they were needed in order to essentially do the same programming work twice, or they could decide to only release their games on one console or the other. Many developers chose to limit the number of games that they would publish on the PS3, and Sony wisely made the decision to adopt more industry-standard architecture for the Playstation 4.

Why did many developers choose to create games exclusively for the XBOX 360 and the PC instead of for the Playstation 3? Part of the answer is simple economics: since the 360's and the PC's architectures were so similar, game designers and programmers could develop one version of the game that could easily be made to function on both platforms, thereby increasing the game's potential sales. The underlying reason for migrating away from the PS3, however, is deeper than that. Not only was programming for the Cell processor different than programming for other platforms, the Cell necessitated a style of programming that was different from the previous *two generations* of consoles and the past *decade* of PC graphics cards. Conversely, the system architecture for the XBOX 360 and current-generation PCs was largely similar to the architectures of previous gaming consoles. In order for designers to create games for the PS3, not only did they have to dedicate additional personnel to ensure a multi-platform release, they also had to *re-learn* how to program.

The Playstation 3 was challenging not just the 360 and the PC, but also the *collective knowledge of programming* held by the digital design Community of Practice, influenced by a decade or more of hardware that shared similar architecture. In other words, the Playstation 3

encountered issues drawing developers to create for it because of the influence of the causal network of hardware and software that still contained, among others, the original XBOX, and even the Playstation 1 and Playstation 2. Sony had helped create their own undoing before the PS3 was ever designed. Note that in the excerpt above Levine does not discuss *how he knows* that similarity among the various development platforms will impact the design process—rather, he is making causal claims about the interactions of designers, consumers, and hardware.

Software

Software, while not physical, also has objective material properties whose causal power within the digital designer network and whose impact on the creative process is reflected in digital design discourse. While hardware provides the physical platforms and processing power necessary to create digital work, software provides the creative platforms and logical algorithms that facilitate artistic media production on digital devices. In addition, creative media software has a tangible impact on the functionalities, interfaces, and aesthetics of digital art and design.

In *Wired's* July 2005 issue, science fiction author William Gibson is discussing the ways that nonlinear editing and data storage software fundamentally change the way creativity is performed. Gibson describes "cut and paste" creativity, where art is now a function of computers and artist working together to recombine data:

We live at a peculiar juncture, one in which the record (an object) and the recombinant (a process) still, however briefly, coexist. But there seems little doubt as to the direction things are going. The recombinant is manifest in forms as diverse as Alan Moore's graphic novel *The League of Extraordinary Gentlemen*, machinima generated with game engines (*Quake*, *Doom*, *Halo*), the whole metastasized library of Dean Scream remixes, genre-warping fan fiction from the universes of *Star Trek* or *Buffy* or (more satisfying by far) both at once, the JarJar-less *Phantom Edit* (sound of an audience voting with its fingers)... We seldom legislate new technologies into being. They emerge, and we plunge with them into whatever vortices of change they generate. We legislate after the fact, in a perpetual game of catch-up, as best we can, while our new

technologies redefine us - as surely and perhaps as terribly as we've been redefined by broadcast television.¹²¹

Gibson is not talking about a particular software, but rather the properties of a large set of digital media editing suites that afford the modifying and recombination of media pieces; Manovich describes the potential for variation and modularity as essential properties of all digital media elements.¹²² What is particularly interesting about Gibson's piece is not just the acknowledgement of digital editing software as an important part of "remix" culture,¹²³ or the trend of individuals within networked and computer-saturated societies to take a sort of ownership over media properties by producing their own content using these properties or recombining properties into new types of media artifacts. Rather, an important argument that Gibson offers is that the digital editing software itself drove this cultural change. Rather than conceptualizing the creation and rise of digital editing software as a result of the postmodern cultural values of deconstruction and hybridity that were culturally popularized in the 1990s, Gibson claims that the existence of the software was a major causal instigator of the mass cultural adoption of remix and hybrid digital art.

Gibson's views on the causal impacts of technology upon both society and the design process are fairly common within the digital design community. Where Gibson is describing a process by which the way professional and amateur designers think about art is reconfigured by

¹²¹ Gibson, W. 2005. God's Little Toys. Featured in *Wired*, July 2005; A brief explanation of the various pop-cultural elements and media pieces that Gibson references: *The League of Extraordinary Gentleman* is a graphic novel series written by Alan Moore that combines classic characters from European and American Literature, like Dorian Gray, Dr. Jekyll, and Tom Sawyer, into a superteam that fights threats against the world. Machinima is animation style, generally put together by non-industry designers, that uses video game engines and software to animate characters and scenery. The Dean Scream meme is a collection of video and sound media pieces that use the infamous Howard Dean "scream" from his 2004 Democratic Presidential Primary campaign, where Dean screamed into a microphone during one of his campaign speeches. Finally, *The Phantom Edit* is a re-edited version of George Lucas's *Star Wars: The Phantom Menace* that removes Jar-Jar Binks from the film and changes the pacing and some dialog in the film. The edit and its creator, Mike Nichols, both received critical acclaim.

¹²² Manovich, L. (1999) *The Language of new media*

¹²³ Lessig, L (2009) *Remix: Making Art and Commerce Thrive in the New Economy*. Penguin Books

media technology, other designers speak more directly to specific software's direct impact on digital art. Take, for example, interviews with Kim Libreri, a designer at VFX house Digital Domain, and computer scientist Ron Fedkiw as presented in the December 2007 issue of *Wired*. In the following excerpts, Libreri and Fedkiw discuss the role of software as a negotiator in the design process:

A consultant to Industrial Light & Magic on the making of *Terminator 3: Rise of the Machines*, *Star Wars Episode III: Revenge of the Sith*, and *Poseidon*, Fedkiw points me to a short CG sequence on his Web site that shows ice cubes tumbling into a glass of shimmering water, then sloshing around until they're dissolved. It doesn't seem that impressive until you realize that the simulation is done exclusively with algorithms that know how ice, water, and light interact naturally. Once the animation is initiated, the animator is completely hands-off. The result is not only realistic but also utterly random — different every time — exactly as if you tossed a handful of ice cubes into your scotch and jiggled the glass until they melted.¹²⁴

Author Michael Behar explains how the animation of ice cubes is aesthetically pleasing but driven by the decisions made by software and its algorithms. The interview continues:

"Over-controlling simulations can ruin all the beautiful physics," Fedkiw told me. "We've found that less control, better algorithms, and a different breed of artist is the key."¹²⁵

What is creating the art in these visual effects simulations are the virtual physics as controlled by algorithmic expressions within the software, as influenced by *the properties of physics as observed in physical world*. The visual effects designer is not just attempting to create an aesthetically pleasing scene, the designer is trying to create a scene that mirrors the audience's expectations of the properties of the natural world. The ontological approach of the digital designer, the focus on properties and their causal effects, extends beyond the technologies they engage with, but must also concern itself with the material properties of the physics of the real world. When Fedkiw cites "better algorithms," he is not just making a

¹²⁴ Behar, M. (2007) "The Software that will Take Digital F/X to the Next Level of Awesome", published in the December 2007 issue of *Wired*

¹²⁵ *Ibid.*

subjective value judgment on how good a particular end-result may look. "Better algorithms" are algorithms that more accurately behave like physical matter would behave in the natural world. In designer ontology, algorithms and aesthetic results can be objectively, not subjectively, better.

Not only can software algorithms drive the look and motion of a digital art piece, Fedkiw also notes that digital artists must learn to give up some amount of control of their scenes to their computers. The aesthetic and the simulation software demands "a different breed of artist," one who is comfortable negotiating the look and feel of a scene with the software being used. Again, we are beginning to see hints that the computer is conceptualized as more than just a tool by digital designers.

However, this is not to say that the digital design process is a "push-button" one, where software and hardware do all the work for the designer. Most of the time the design process is a negotiation between the software and the artist; not all animation is a natural-world simulation or re-creation, and there are times when simulations of the natural environment interfere with the desired look of a piece, even if the subject of the piece is natural world phenomena. Consider another excerpt from the article quoted above:

"In *Poseidon* we had to do this big splash of water on the decks," Libreri recalls. "But we couldn't get the simulator to do what the director wanted." It turned out that the simulator worked perfectly: A 200-foot wave slamming into a cruise ship is going to do whatever the hell it wants. The irony is that Nucleus and PhysBAM may not make the work of a filmmaker any easier. Caltech's Schrder explains: "Let's say the director wants a shot where you let go of a cloth, and he wants that cloth to land on a particular branch in a particular tree. In the real world, what are the chances it will land on that branch? Basically, zero." And there's the rub: A perfect CG simulator for the real world will replicate precisely what happens in the real world: chaos.¹²⁶

The software in each of the scenes described above, even when working correctly, can interfere with the artistic choices of artists and designers. In these situations, digital artists

¹²⁶ *ibid.*

invoke a blend of a few different shared repertoires, or problem-solving and design strategies. At times, the look of the scene, the functionality of the website, or the design of the game will change in order to accommodate the technical constraints or capacities of the software being used. Elizabeth in *Bioshock Infinite*, for example, was originally intended to be a much more active participant in combat with the player in the initial stages of the game's design. Previsualization videos from *Infinite*, or videos that help game designers visualize the direction the game they're working on is going in, show Elizabeth using magical abilities in conjunction with Booker, attacking foes and augmenting and combining Booker's guns and magic with her own. These behaviors proved to be too complicated for the AI system running Elizabeth, and the developers were forced to cut that functionality from the game.

In addition to changing the final product, designers can also change the production pipeline to take advantage of the strengths of various software packages rather than being constrained by one piece of software. Designers must be cognizant of the properties and affordances of these software platforms. Are they making sense of these platforms and doing epistemological work? Surely. However, there is also something inherent about the objective properties of the creative software that helps lead designers to come to these understandings.

When animating a 3D character, for example, it is common to model (the process of constructing the digital body of the character) the character in Maya a powerful, but generalist, 3D modeling and animation suite, and export that model to MotionBuilder, a specialized 3D animation suite built for character animation. Once in MotionBuilder, the character is rigged (the process of attaching the controls that make the character move, like the strings on a marionette) and then animated. MotionBuilder's rendering engine, the software that calculates the way light bounces, the look of motion blur, and the textures of materials for the final animated shot is fairly minimalistic, however, so characters, their rigs, and their animations are

then exported back into Maya, which provides a robust and flexible rendering engine, for the completion of the project.

The multiple-tool process gives the designer the most creative control, with the obvious drawback of complicating the production pipeline. It also forces the designer to think not just of how the (in this case) animation is looking, but also of how the various elements of various programs will interact with one another. While some programs are coded to work well together, others must be "hacked" by designers in order to properly communicate with one another. When animating a character in MotionBuilder, the animator is concerned with both the aesthetic appeal of the animation for the audience and the technical "appeal" of the animation as judged by Maya. The properties of MotionBuilder and Maya contribute to the way designers construct meaning about these software packages.

The designer Community of Practice can also adopt new programming and artistic techniques and new shared repertoires that can help overcome the creative constraints imposed upon them by programs and hardware that otherwise afford them great creative flexibility. Take, for example, Ken Levine's explanation of the evolution of gameplay and graphics in videogames from the beginning of a generation to the end of a generation, i.e., games at the end of a console's lifecycle look better and are more complex than even though they are produced using the same hardware and software:

If you look at *Bioshock 1* and you look at *Bioshock Infinite*, and realize that... they're running on exactly the same hardware on the PS3 and the XBOX 360... It's amazing what can happen, what knowledge can do, you know, new programming knowledge and art knowledge can do over the course of a generation. The kind of experiences you have in the beginning of a generation and what you can do at the end... it's kind of awe [inspiring]... I always think it's one of the things that makes me proudest to be in the gaming industry, because it's the power of engineering, you know, it's the power of good, smart people...

¹²⁷

¹²⁷ Quote taken from an interview conducted by Kevin VanOrd from "The Break Room," published on Youtube by Gamespot on March 20, 2013. The Interview is titled "We Can Kill the Industry With Cynicism

Levine describes the leap in graphics and game experience that happens within a generation is not the result of new hardware, but rather of the creation of new ways of *doing*. New ways of programming digital media better take advantage of a console's properties. Digital artistic knowledge evolves as well. For example, the way that assets are built within game and animation engines can be constructed in a way that keeps their aesthetic fidelity while also using less system power. 3D models are collections of polygons, two-dimensional geometric surfaces--faces--that are combined within 3D space to create a mesh that forms the edges and contours of the 3D object. The more polygons a model contains, the more detailed a model can be--surfaces can be smoother, and edges can be more natural and seamless. However, the more polygons a model contains, the more that model drains the memory resources of the machine operating the model. Digital artists learn to create models and characters that are still pleasing to the human eye, but that have as little polygons as possible. In large studio settings, the modeler and animator are two distinct jobs; so the modeler must also be aware of the animator's needs (which themselves are partially driven by the needs of the animator's software) as well. The "audiences" that a character artist or 3D modeler designs for, the needs

that the designer must meet, are both producer and consumer, both human and machine.¹²⁸



Figure 4: Drake and his polygon "wireframe" mesh from Naughty Dog's *Uncharted 4*

Levine continues this discussion by bringing software into the mix:

[In] *Bioshock 1*, you're a single guy in a corridor, fighting a monster or two, with views that don't go out very far. ...[Using] the Unreal Engine, that's exactly what you wanna make. And we still pushed it at the time, we thought to its limits, when we made that game. It wasn't like we [said] "Oh, this is easy!" We worked really hard. We had to optimize and make all these decisions... And then we go on to make [*Bioshock Infinite*] which has these huge vistas and floating buildings and tons of characters around you and then to add on top of it Elizabeth, who is a substantial drain on system resources... She's always around, she's always pathfinding, she's always looking for things to do. If you know anything about game programming, you know these are very expensive things [in terms of computer memory]. They did it though, in the same piece of hardware. It's incredible to me.¹²⁹

¹²⁸ Drake and *Uncharted 4* are properties of Naughty Dog, Inc., a division of Sony Computer Entertainment. This image was taken from the *Official Playstation Magazine* website, last accessed March 10, 2014. (<http://media.officialplaystationmagazine.co.uk/files/2012/01/Drake-close-up-wireframe1.jpg>)

¹²⁹ Quote taken from an interview conducted by Kevin VanOrd from "The Break Room," published on Youtube by Gamespot on March 20, 2013. The Interview is titled "We Can Kill the Industry With Cynicism - Ken Levine - Bioshock" Last accessed March 3, 2014 at (<http://www.youtube.com/watch?v=JwsjALh2vYA>)

Again, we can see evidence of the design process as a negotiation among the properties of machines and the actions and understandings of humans. The Unreal Engine is a game-development software platform that provides both artistic tools for generating characters and landscapes (although most game art is produced in different software environments earlier in the production pipeline) as well as algorithmic and programming tools that allow for the control and manipulation of gameworld physics, player-character behavior, and non-player character scripting and artificial intelligence. As Levine notes, the architecture of Unreal functions best when it is running a game with a limited amount of environmental detail to render and a small amount of artificial intelligence agents to calculate. *Bioshock 1's* setting, which took place in an abandoned underwater city whose buildings were connected together by narrow tubes fit Unreal's architecture well. *Bioshock Infinite*, released five years later, was the beneficiary of half a decade's worth of development in game art and programming techniques that optimized multiple characters and large, sprawling environments for the Unreal Engine. This collective knowledge furthered by the design CoP in conjunction with Unreal afforded Levine and his team the opportunity to create a game the scale of *Infinite*. In addition, the advancement of collective knowledge also allowed for the creation of Elizabeth, who herself becomes an agent of negotiation in the design process. The design process, and developers' understanding of the design process, is causally effected by both the material properties of the tools they work with and the properties of the design solutions that have been created.

The design community as a whole seems to point to the impact of the properties of hardware and software of the tools that they use upon the creative process and the final form of their work. It is important to re-emphasize that the creative tools used by designers to not *determine* the media that is produced; as the above quotes and stories have hopefully shown, the human element of design, both the artistic vision of the designer and the desires of the

human audience, are also a major causal power within the network of design. However, the discourse above provides empirical evidence that the artistic product in digital design is not *only* the result of human creative decisions.

Agents of Social Change

If digital designers are focused on the needs of the "designee" as well, it would follow that this practical focus would be reflected in Community of Practice discourse. And indeed it is. The beginning of this section charted the prevalence of ontological talk within digital design CoP discourse. The most common forms of ontic talk were about the properties of technology and its impacts on the design process. Although not specifically talk about the end-results of the design process *per se*, this practices described in these discourses did show the needs of the human and computer users of design to be important considerations in the causal network of digital design. A smaller, yet still substantial, percentage of discourse (36% of *Wired* articles in addition to a discursive presence at SIGGRAPH and Cipher Prime) contained talk about how the properties of the products of digital design would shape and change society as a whole.

What is interesting about the quality of the discourse seen is where the designer place the locus of power for social change. Despite the fact that the technologies in question are created by digital designers, digital designers rarely place themselves at the center of the dynamic of social change, preferring instead to cite the causal powers of the designed technology itself as a major, if not *the* major, factor. In *Wired*, this trend is evident as early as the very first issue, published in March of 1993. In the article the following excerpt was drawn from, John Browning proposes the various actants that will shape the future of libraries and publishing:

What happens to the publishing industry when publishers can reduce their risks by not printing any copies of all but the most popular journals on paper - but instead can wait for interested readers to print their own copies of the articles they want? ...None of these changes will happen overnight. Until there is a

universally agreed and available formatting language - which is still a long way off - librarians plan to work with bit-mapped images of books. The electronic image of a book is still a few gigabytes worth of information... several times more than what fits into most of today's computers or flows conveniently through computer networks. But as the changes add up over time, those most transformed may well be libraries themselves. The logic of technology makes librarians and editors increasingly interchangeable. By lowering the costs of reproduction, and thus increasing the amount of information published, new technology increases the value of the judgments made by librarians and online searchers as they pick and choose what their customers might want to read. Eventually, publication may come to mean no more than somebody grabbing a document from the author's networked computer.¹³⁰

Note the various causal interactions that Browning argues will shape the future: the economics of the publishing industry, the desires of the consumer readership, the value judgments of librarians and readers, the physical properties of printing on paper, the file size of digital books, a widely-accepted digital format for digital books, the size of computer hard drives, and the speed of computer networks. The future will be determined by a network of humans and non-humans, of social values and material properties. More importantly, designed technology is the causal impetus within this network: Browning claims "The logic of technology" changes the relationship between librarians and publishers, that "new technology increases the value of the judgments made by librarians," and "as [technological] changes happen over time, those most transformed may well be libraries..."¹³¹

The digital design ontology remains consistent over time. Nineteen years later, *Wired* publishes "The New MakerBot Replicator Might Just Change Your World," an article written in October 2012 by editor-in-chief Chris Anderson, that details the social and economic changes that will be brought about by 3D printing, specifically the Replicator 2, developed by MakerBot. The title of the article itself again places causal impetus on the designed technology. Again, the

¹³⁰ Browning, J. (1993). "Libraries Without Walls for Books Without Pages." First published in the March 1993 edition of *Wired*.

¹³¹ *Ibid.*

future (in this case, the future-present) is constructed by a causal network of humans and technology:

A home 3-D printer is fun. The *concept* of a home 3-D printer, though, is the beginning of a new industrial revolution. That's because those CAD files you created for your Replicator 2 can just as easily drive industrial robots; MakerBots speak G-code, the standard machine control language in manufacturing... So once you have a design on your computer, you can prototype a single copy on your desktop fabricator—or upload it to a commercial manufacturing service and generate thousands... Modern CAD software like the free Autodesk 123D even offers wizards to make it simple to go from one copy to many... “Before people buy a MakerBot, they think of all the practical applications—all the stuff they can cross off their ‘honey-do’ list, the things they can fix around the house”—broken parts on the bike or the dishwasher, or a new toothbrush holder to fit a tight space. “But once they have it,” [MakerBot designer Bre Pettis] says, “their mind flips a switch. They start printing out amazing things, wonderful things.”¹³²

MakerBots speak the correct language needed to communicate with industrial machinery to mass produce created content. Autodesk 123D makes the individual-to-mass production process easier, further contributing to the democratization of design that was discussed in Chapter 1. The existence of the Internet—which possesses a faster and more robust architecture than when Browning writes—affords direct communication between consumer-designers and mass industry. Users begin creating “amazing things, wonderful things” only after they purchase the Replicator—only after they begin engaging with the material properties and affordances of the technology. These properties in turn help shape consumer understandings of the technologies with which they engage.

Robert Michael Smith, a digital sculptor and faculty member at NYU, seems to support Pettis's assessment. At a talk at SIGGRAPH 2013, Smith described how playing with a 3D printer helped inspire him—along with his love of science fiction—to seek out medical facilities and research scientists that specialized in 3D bioprinting, or the use of 3D printers to create

¹³² Carpenter, J. (2012) “The New MakerBot Replicator Might Just Change Your World.” First published in the October 2012 issue of *Wired*.

biomaterial like internal organs for skin for medical transplants.¹³³ Smith then used these bioprinters to create bioart, sculptures made out of printed biomaterial--a "living" lattice of cells. The sculpture is connected to a dialysis machine that provides blood flow to the cells to sustain them, and, in the future, will be controlled by artificial intelligence software to control the sculpture's movement and response to physical stimuli. Smith argues that the affordances both the 3D printer and the biological printed material were key for his inspiration in creating his art.

It is important to point out that Johnson, Pettis, and Smith's descriptions of the causal network are more nuanced than Browning's--here, the MakerBot Replicator does not just impact human behavior, it also drives the creation of new *ideas*, which themselves possess power within the causal network. Or, in Smith's case, the concepts brought about by interaction with the Replicator and biomaterial meld with his love of science fiction to inspire him to create 3D bioart. The ramifications of this generation and interaction of ideas will be discussed in Chapter 3.

This social change and the technology that helps effect this change, of course, have a resonant impact back upon the practices and norms of the digital design Community of Practice. Newer web platforms, particularly dynamically-generated and user-generated webpages and social media, for example, have impacted the way in which digital designers collaborate with one another, particularly for amateur designers. The process of digital design is rarely an individual activity. The "classic" digital design environment, the physically co-located office or studio space, affords itself to collaboration (to various degrees, depending on the properties of

¹³³ Robert Michael Smith spoke at a panel presentation alongside Daniel Collins, John William Penn, and Don Vance on the potential impacts of 3D printers on July 21, 2013 at SIGGRAPH 2013 in Anaheim, CA. The panel was titled "The Bleeding Edge of 3D Printing and Digital Fabrication."

the physical space). Designers can physically walk up to each other and engage each other and each other's work.

Non-professional, non-student designers, most of whose work is created in the privacy of their homes, rarely have this luxury. Dynamic web technologies afford non-professionals the ability to both share and distribute their completed work, as well as to gain access to critiques of their work-in-progress. The "stage and share" non-professional pipeline, where incremental versions of in-progress work are shown to an audience of critics via the web, is very similar to client-based work in professional settings, where professional designers show their clients incremental versions of their product to ensure that the product is meeting the client's desires.¹³⁴

Often, these dynamic web presences also serve as a discursive tool that connects amateur and professional artists and designers with one another. CGTalk (www.cgtalk.com) a forum and portfolio-sharing site run by the Computer Graphics Society, "supports artists at every level by offering a range of services to connect, inform, educate and promote digital artists worldwide."¹³⁵ The CGTalk forums and portfolio pages are great resources for professionals to network, and for amateurs to critique one another and receive advice from high-level professionals. Some of this advice is about how to make the jump from non-professional to professional, but most is aesthetic critique or technical assistance.

Similarly, OverClocked ReMix, a non-profit game music remix organization, hosts www.ocremix.org, a site devoted primarily to allowing amateur digital sound artists to upload remixes and re-recordings of videogame soundtracks for critique and sharing. That the site is dedicated to videogame soundtracks reinforces both the creator-consumer identity of designers and the regular overlapping of digital design Communities of Practice with geek culture and

¹³⁴ This process rarely goes as smoothly as it should. Clients are fickle beasts.

¹³⁵ Taken from the CGSociety's mission statement, located at (www.cgsociety.org)

generative fan culture.¹³⁶ OCREmix is of particular interest because their popularity among the design community resulted in Capcom, a large games publisher, contracting the OCREmix community to create the soundtrack for a commercially released game. *Super Street Fighter II Turbo HD Remix*, an updated version of Capcom's classic *Street Fighter II*, featured 66 tracks that were individually and collaboratively composed by over twenty non-professionals that were contracted because of their published work on OCREmix.

Again, this is not to say that the properties and causal powers of network technology and dynamically-constructed web pages *determined* that CGTalk and OCREmix would exist, much less that they would have the social buy-in and commercial success that they have. Nor would the lack of these technologies necessarily preclude non-professional designers from existing and collaborating with one another. Rather, the presence and properties of these platforms have causal impacts on the form of practice and discourse that occurs within the design community, as well as on the structure of the CoP and the products that are generated as a result of the CoP. The technology does not *control* the CoP, rather it *contributes* to it, and helps shape it, much like the human members of the digital design CoP do.

Technology and Meaning

As demonstrated in the previous section, designer talk makes ontological claims about differences in gameplay, consumption, the design experience, and the greater social world as impacted by the properties and causal powers of those properties of the technologies and world they interact with. They are making ontological assertions about the objective, independent properties of the world; they are not talking about "how they know" but rather "what the experience is." How do we as social scientists best account for this talk? Is it not that in reality the properties of the thing are in fact having this effect? The constructivist ontology outlined

¹³⁶ Jenkins, H. (2004) *Convergence Culture*

earlier may argue that designer discourse does not reflect the world, but rather reflects their understandings and perspectives of the world. So designers are not necessarily being affected by the objective causal powers of technology, but instead are subjectively constructing technology as a causal agent. I would agree that design discourse shows how designers represent and understand the tools that they work with and alongside. I believe the necessary follow-up question would be then: what is *causing* them to think and understand technology in this way? While cultural norms and values undoubtedly contribute to this understanding of the world as Chapter 3 will discuss, the technology itself is also contributing to this understanding.

There is another issue that may be more controversial. Remember that Lave and Wenger define a primary outcome of a Community of Practice as the negotiation and construction of “meaning” for members of the community.¹³⁷ How the community identifies itself, how individuals within the community identify themselves, how they understand the domain of the community, how they *interpret the world they live in*, are all elements that are intersubjectively negotiated. To be a part of the CoP is to both contribute to and be impacted by the meanings that the community makes.

Lave and Wenger are arguing this point based on the axiomatic assumption that only humans interpret that world and make meaning. However, doesn't Elizabeth from *Bioshock Infinite* interpret the gameworld? Does she not interact with the objects of the game, like the player does, make decisions about how to interact with those objects, and have her experience of the gameworld change as a result of the interaction with those objects? Similarly, isn't the

¹³⁷ Lave, J. and Wenger, E. (1999). *Situated Learning: Legitimate Peripheral Participation (Learning in Doing: Social, Cognitive and Computational Perspectives)*. Cambridge University Press

player impacted by the way that Elizabeth perceives and interprets the gameworld? The player perceives Elizabeth as a *Du* entity.¹³⁸ Is she a part of the gaming community?

In order to address whether or not software and hardware can be a member of the digital design community, in addition to being a part of the digital design causal network, we have to address two fundamental questions: Can non-humans make meaning, and, subsequently, can non-living things make meaning?

What does “meaning” mean? For philosopher and linguist Charles S. Peirce, meaning is the result of cognitive negotiations of the interpretations of the world.¹³⁹ In other words, meaning is the value and understanding humans cognize about observed events and ideas. For Peirce, this type of semiosis requires cognition; the ability to process and interpret the signifying elements generated by objects. This is an important point: Peirce separates the meaning that is created within the mind of a human via causal connection from the properties of the objects that determine that causal connection. The classic example of Peirce's semiotics is smoke and fire.¹⁴⁰ Fire generates smoke, and therefore is part of a causal network. Human beings, however, see smoke, and interpret the smoke as the presence of fire, as well as potentially a sign of danger, or an indicator of overcooked food. Smoke is a signifying element of fire, and is cognized as having a connection with fire and heat and danger within the human mind. According to Peirce, interpretation and meaning, while dependent on the material conditions that make sign generation possible, are solely the domain of the human mind.¹⁴¹

Lave, Wenger, and the constructivists would most likely be sympathetic of this account of meaning in relation to technology. They may dispute technology's effect on human

¹³⁸ Various online exchanges, computers and human book

¹³⁹ Peirce, C.S. (1883) *Studies in Logic by members of the Johns Hopkins University*. Ed. Charles S. Peirce, Boston: Little Brown

¹⁴⁰ Stanford Encyclopedia of Philosophy, “Peirce's Theory of Signs.”

(<http://plato.stanford.edu/entries/peirce-semiotics/>) Last accessed 3/19/2014

¹⁴¹ *Ibid.*

understanding (we can't be technological determinists, after all!), but the claim that meaning is solely the domain of human cognition would be a welcome one. See, for example, Games Studies scholar T. L. Taylor's description of meaning and activity within an online game:

Outside of any individual player's time the [online game] account is, in fact, devoid of meaning or game status. It takes a player to create a character, and it takes the time of the player to develop that character. Through her labor she imbues it with qualities, status, accomplishments. Indeed, while the owners of a game provide the raw materials through which users can participate in a space, it is in large part *only through the labor of the players* that dynamic identities and characters are created, that culture and community come to grow, and that the game is made animate.¹⁴²

Taylor's understanding of the "meaning" of a game is an example of Peircian model of meaning. The game and the player's account are "devoid of meaning or game status" on their own. There is an acknowledgement of the "raw materials" that the owners (a neo-Marxist name for the game developers, perhaps?) provide, but the labor of the player "imbues" the game with qualities, with meanings, with purpose. "The game is made animate" via the players—both mechanically, as it is the players that operate the game and move through the gameworld, and meaningfully, i.e., the game is not a game until a human is playing it.

Does the character of Elizabeth throw a wrench into this conceptualization of meaning and gameplay? It is true that Elizabeth needs the player in order to advance through the game, but so too does the player need Elizabeth. Elizabeth is the character capable of picking locks on safes to get the player more money and equipment, and capable of unlocking doors to further parts of the gameworld. Conversely, Elizabeth can point out hidden items and plot elements in the game environment that the player may not have perceived, but often needs the player to do the actual interacting with these objects. *Bioshock Infinite* is in many ways a co-operative, two-

¹⁴² Taylor, T.L. (2006) *Play Between Worlds: Exploring Online Game Culture*. Cambridge, MA: The MIT Press. My introduction to this excerpt was via Behrenshausen, B. (2013), "The Active Audience, Again: Player Centric Game Studies and the Problem of Binarism", in *New Media and Society*, September 2013, Vol. 16, Issue 6

player game, with only one human player. Still, does Elizabeth have the ability to contribute to the construction of meaning of the game? To be a part of the game players' Community of Practice? From a strict Peircian perspective, the answer would be an emphatic "no:" Elizabeth is not a human, and does not possess human cognition, and therefore cannot interpret the world, much less participate in a social construction of an understanding of the world.

Eduardo Kohn, however, offers us an intriguing transformation of Pierce's ideas. Kohn argues that humans are not the only beings capable of cognizing and interpreting the world; that, in fact, all living things are able to interpret the world, create a sense of their place in it, and come to an understanding of it. All living beings can make meaning, and all living beings possess an ontology. Furthermore, Kohn argues that all living beings can engage in semiotic construction. For Kohn, social construction of the world is brought about by a negotiation of meaning between cognizing persons, or "selves." However, "selves" are not exclusively human:

Wherever there are "living thoughts" there is also a "self." "Self," at its most basic level, is a product of semiosis. It is the locus--however rudimentary and ephemeral--of a living dynamic by which signs come to represent the world around them to a "someone" who emerges as such as a result of this process. The world is thus "animate." "We" are not the only kind of *we*.¹⁴³

In the above quote, Kohn is theorizing that all living things, from humans to cats to plants, interpret the world. Their interpretation of the world both makes them an active participant of the world but also creates an awareness of separation from the world, the locus of the self. For Kohn, all living beings undergo this process of interpretation and "self"-making, although not necessarily linguistically, as humans do. The interpretive system of meaning-making can be as "rudimentary" as an antelope recognizing some form of danger inherent in the tiger lurking in the bushes, or as "ephemeral" as the *Ophrys apifera*--the "bee orchid"--a plant whose flowers evolved to take the shape and coloring of a long-extinct female bee in order to

¹⁴³ Kohn, E. (2013). *How Forests Think: Toward and Anthropology Beyond the Human*. University of California Press. Page 16

lure long-extinct male bees to pollinate it. Somewhat romantically, the bee orchid's flowers are the plant's interpretation of an extinct male bee's interpretation of an extinct female bee, and, as pointed out by Randall Munroe, the only basis of humanity's knowledge of the previous existence of that bee.¹⁴⁴

The semiotic existence that makes living beings selves is reinforced by humanity's ability to participate in *Ich-Du* relationships with other forms of life, not just *Ich-Es* relationships. Kohn uses the example of the Runa, an Amazonian tribe, and their relationship with the jaguars that inhabit the forest. In addition to the Runa believing the jaguars to be sacred spirits, they also base their hunting "best practices" on the jaguar's interpretations of humans: when sleeping in the forests during overnight hunts, Runa hunters sleep face-up in order to avoid being eaten by a jaguar. When a human sleeps face-up, the jaguar recognizes the person as a fellow hunter, and leaves them alone. When a human sleeps face down, the jaguar recognizes the human as prey. From a Communities of Practice perspective, the "shared repertoire" of the way to ensure a safe hunt is one that is negotiated between the human and jaguar members of the forest CoP.

Kohn is a constructivist. As such, it can be hard to tell to what Kohn is referring when he makes claims about the "world" that jaguars and the Runa co-inhabit. It is likely that Kohn is talking about the understanding that the Runa have about the jaguars and their world instead of the objective world itself; i.e., it may not actually be safer for Runa hunters to sleep face-up in the forest than face-down. In the understood "world" of the Runa, jaguars are selves who don't eat hunters if they sleep face-up, and that is what matters.

However, I find it useful to take Kohn more literally--or rather, view his ideas through the lens of philosophical realism--than Kohn himself does. Jaguars *are* a concern for the Runa hunters in the Amazon, just as hunters are a concern for the jaguars. The movements, actions,

¹⁴⁴ Munroe, R. XKCD: "Bee Orchid" (<http://xkcd.com/1259/>) Last accessed 3/22/2014

and practices of survival in the Amazon is a negotiation among the various forest predators (including humans), their prey, and the material and ecological properties of the forest itself. Each living thing of the forest constructs an understanding of the forest and the other living things that inhabit it, and formulates survival strategies based on those interpretations. These strategies are as varied as the creatures that interpret the world: sleeping face-up (humans), avoiding human settlements whenever possible (jaguars), or mimicking the shape of a female bee (the bee orchid).

If non-human life can engage in interpretation of the world, and therefore contribute to meaning-making, can things? Can computers and digital objects? Philosopher and Games Studies Scholar Ian Bogost argues that they can, and that social scientists and philosophers need to devote more analytical effort towards understanding object experience, particularly the experiences of computer objects. More specifically, Bogost argues for a post-postmodern model of object inquiry, where due respect is given to the relationships and interpretations of the world aside from those with humans that objects undergo:

To be sure, computers often *do* entail human experience and perception. The human operator views words and images rendered on a display, applies physical forces to a mouse, seats memory chips into motherboard sockets. But not always. Indeed, for the computer to operate at all *for us* first requires a wealth of interactions to take place *for itself*. As operators or engineers, we may be able to describe how such objects and assemblages *work*. But what do they *experience*? What's their proper phenomenology? In short, what is it like to be a thing?¹⁴⁵

Bogost's concept of "alien phenomenology" claims that objects interpret the world and have phenomenological experiences, although these experiences may be quite different than human ones. These phenomenological and interpretive processes can impact humans, but they are not reducible to their impact on humans. Digital design history and discourse shows us the

¹⁴⁵ Bogost, I. (2012) *Alien Phenomenology, or, What It's Like to Be a Thing*. University of Minnesota Press, Minneapolis, MN

effects of the interpretation and experiences of the world that computers and software have on the design process.

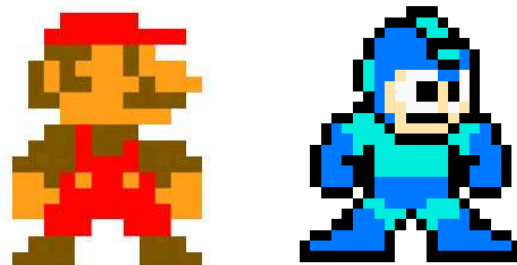
One such historical example of the negotiation of meaning among computers and humans is the use and deployment of color in videogames. While graphics and aesthetics in videogames are obviously heavily influenced by the economic resources invested into a game's development team and social and cultural influences upon the designers, the constraints and technological affordances of the hardware, i.e., its properties, that run the game also have creative influence. The way that computers "interpret" and "understand" color becomes a part of the aesthetics of design.

Computers do not see and experience color in the same way that humans do. For a human, color is an emergent property that occurs when our eyes see rays of light that are emitted from or reflect off of the surface of an object. The "red" of an apple that humans perceive is the frequency of the wavelengths of light that are reflected off of, as opposed to absorbed by, the apple's skin. In addition, humans cannot see all of the wavelengths of light reflected by the apple—as any high school physics student can tell you, the range of the wavelengths of light that the human eye can perceive, and therefore the amount of colors that humans can see, is actually quite limited. In an interesting way this harkens back to the discussion of ontology and epistemology. Color is a secondary quality that humans experience. We can, however, step out of that experience—our ability to step out of that experience is the only way that we can cognize that there are wavelengths of light that exist that we cannot perceive as color. If a tree falls in the forest and no subjects are there to perceive it, it may not make a sound, but it certainly does make sound waves.

For computers, color is not a secondary quality that occurs from reflections of light, but rather is a textual string of information stored in memory that is declared as a property of a

particular coded object. For a computer running a basic object-oriented programming language designed to display color information, the result of `Apple.color()`, a function that investigates the “color” property of the object “Apple,” may be `#FF1200`, a hexadecimal code. When the computer displays the apple object to the player, it uses the values of the hexadecimal code to determine the Red, Green, and Blue pixel values that are arranged and displayed to the human viewer to create an image of a red apple. As Bogost notes in the quote above, the human user experiences color visually through the computer, but the interpretive and procedural processes that the computer performs for itself in order to store and display color information to the user have little to nothing to do with physical manifestations of color. For the computer, color is text.

Since color as understood by computers is a textual object, storing colors takes up space in the computer's memory. Translating these textual values into color values suitable for human perception also takes memory. The amount of available machine memory therefore directly impacts the meaning and value of color for digital designers and artists during the design process. For example, the original Nintendo Entertainment System's (NES) 8-bit processor was limited to displaying only 12 distinct colors on the screen at one time. This memory constraint forced game designers to limit the color palettes of their on-screen characters and the background imagery that composed the gameworld that players and game characters interacted with. Because of this constraint, character sprites, the two-dimensional graphical representation of the character, generally contained a maximum of three or four total colors. The Mario sprite from *Super Mario Brothers* on the NES was built using only three colors, red, brown, and orange. Similarly, the Mega Man sprite from the *Mega Man* NES series was constructed out of only four colors, light blue, dark blue, tan, and white, with a fifth accent color, black, that was actually created by the *absence* of color data.



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The color palette for game levels, then, is determined by the colors used for the character sprites and whatever remaining memory slots are available for color storage and generation. In the case of *Mega Man* levels, this meant that the gameworld shown on the screen at any one time could contain only

eight colors beyond the Mega Man character sprite's colors. In general, this limitation drove game developers to "theme" their levels in order to achieve both high aesthetic value and give the levels material "context."¹⁴⁷ For example, a level may be "fire" themed, which



Figure 5: A Scene from Quick Man's Level, *Megaman 2*

would allow the designers and level artists to restrict their color palettes to a range of reds, browns, and oranges, giving them access to a greater variety of those hues while also justifying the limited color palette to the player.¹⁴⁸

The process and the design of *Mega Man* levels, then, includes a negotiation of the value and understanding of "color" by both the human designers and the computer facilitators.

¹⁴⁶ Mario from *Super Mario Brothers* and Mega Man from *Mega Man*, owned by Nintendo Entertainment and Capcom, respectively

¹⁴⁷ Bogost, I. (2013) *Racing the Beam*

¹⁴⁸ Image taken from *Mega Man 2*, "Quick Man's Level." Image found within the article "The Ultimate Mega Man Retrospective," written by Brett Elston for gamesradar.com, June 23, 2012. URL located at (<http://www.gamesradar.com/the-ultimate-mega-man-retrospective/>), last accessed 3/22/2014

For humans, color is a representation of objects in the real world, and combinations of colors both perform a signifying act (representing the environment and its temperature) and must be aesthetically pleasing. For the computer, color is a piece of textual information associated with digital objects that both takes up space in memory and must be translated into visual information for humans. The game world is a negotiation of these interpretations and "meanings" of color.

In addition, the results of these negotiated designs themselves become calcified practical and cultural values over time. While character and level color-themeing was originally a strategy to creatively deal with limited color sets, it is now considered a best practice for contemporary game design, despite the vast increase in computing power available to game designers.¹⁴⁹ The increase in memory storage space and speed has given computers the ability to store and display literally millions of colors on the screen at a time. However, game characters and levels continue the tradition of having a specific color range associated with them.

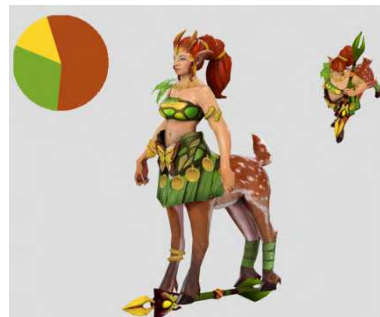


Figure 6: Character coloring guide for DOTA 2

Game developers found that the limited colors of game characters made characters more easily identifiable for players, and players began to associate characters with their color palettes. This has, of course, worked its way into digital design discourse.¹⁵⁰ Game design documents, the "rules sets" for design that developers have to follow during production, often detail three to five colors that should always be associated with a particular character or other important

¹⁴⁹ Dota 2 game design document

¹⁵⁰ An excerpt from the game design document for Dota 2, a 2013 game, outlining the major colors to be associated with this character, including the dominant color and associated colors

element in the game.¹⁵¹ Current incarnations of Mega Man still continue to use a dark-blue/light-blue color scheme, and Mega Man himself is colloquially referred to within gamer circles as "The Blue Bomber." Elizabeth herself has a well-defined color palette of off-whites and rich blues that persist throughout her various costume changes, despite the fact that she was designed well after the practical limitations of color palettes imposed by computer processors were a consideration for designers.

Computers can, in their own way, interpret the world, and their interpretations and understandings of the world do contribute to the process and discourse of design. Under Kohn's model of interpretant-as-self, this would seem to indicate that computers and machines can, indeed, be selves that generate and negotiate meaning. However, they are not necessarily treated as *Du* entities by other designers; i.e., they may be regarded as "its" instead of "yous", as objects instead of selves. For all my critiques of social constructivism, it does have its place; it has been widely demonstrated that communities are largely subjective and socially constructed, and that, for the most part, community members are perceived by others in the community to be selves or persons, not objects.¹⁵² While causal networks may exist independently of human acknowledgement of them, I would hesitate to say the same about a community.

Can a computer or machine be a *Du*, be a self, in the eyes of humans? As mentioned earlier in the chapter, Knorr Centina does demonstrate that particle detectors can be perceived as *Dus* by physicists. As demonstrated by social psychologist Clifford Nass and design researcher Corina Yen, consumers often treat their computers as selves and are emotionally and personally invested in both their computer's personal well being and their computer's view of them.¹⁵³ Humans respond discursively and emotionally to computer entities in a similar way that they

¹⁵¹ *Ibid.*

¹⁵² See, for example, Venkatesh, Lave, Wenger, Gee

¹⁵³ Nass, C. and Yen, C. (2012). *The Man Who Lied to His Laptop: What We Can Learn About Ourselves from Our Machines*. Penguin Group, New York, NY

respond to human entities. Humans communicate with computers socially. Do designers do the same for the pieces of hardware and software they interact with?

Re-enter Elizabeth. In the following excerpt, Ken Levine discusses the frustrations of working with Elizabeth even as he and his team at Irrational Games were creating her:

[Making *Bioshock Infinite* is] not an experience I would want to go through again... There are days that I wouldn't want wake up and go to work because there were things that were so hard to figure out... Times that Elizabeth would be walking into walls. Literally, for months and months and months she was just... "Where's Elizabeth? She disappeared. She fell through the ground. She walked through a wall. She's coming up to you and staring at you creepily. She's missing her marks. She's interacting with the wrong thing." Remember the shark in *Jaws*? All those classic stories. She was our shark in *Jaws*.¹⁵⁴

Apparently Elizabeth, as helpful a co-player as she is, was a pretty lousy co-worker. The "shark in *Jaws*" reference is alluding to the now-legendary stories of how difficult the mechanical shark used in *Jaws* was to work with and act alongside; it would constantly break or "misbehave." Yet the shark was also a major character in the film; the cast and crew had no choice but to work with him. Elizabeth is of similar importance to *Bioshock Infinite*.

Elizabeth is a "self" in this excerpt, even for the team that designed her. She misbehaves. She generates and provokes emotional responses. She does not act upon markers in the game world that were designed for her to act upon. She stares creepily at you. She's a *she*. Elizabeth, like all technology, is socially constructed, both in the classic sense of the term--designers construct her as a person--and in the literal sense of the term--she was built by a community of people. But once she is constructed, she exists independently of us. She has properties and powers derived via those properties to resist both the game programmers who are building her as well as impact the gameworld alongside players. She also has a emergent

¹⁵⁴ Quote taken from an interview conducted by Kevin VanOrd from "The Break Room," published on Youtube by Gamespot on March 20, 2013. The Interview is titled "We Can Kill the Industry With Cynicism - Ken Levine - Bioshock" Last accessed March 3, 2014 at (<http://www.youtube.com/watch?v=JwsjALh2vYA>)

personality, one that exists as an amalgamation of the properties of Elizabeth's dialogue in the script written by Ken Levine, her voice as acted by Courtnee Draper, her scripted in-game actions developed by the Irrational programming team, and her actual in-game decision making and interactions during both consumer gameplay and design playtesting, as partially impacted by the hardware that runs her AI. Yet while Elizabeth is *dependent upon* these persons, objects, and processes for her origin and, in some cases, her continued existence, she is not *reducible to* them. As explained by Latour's concept of irreductionism, Elizabeth is a new whole that emerges from the interplay of these other objects.¹⁵⁵ This new whole, this new self, seems to be discursively constructed as a part of the design Community of Practice by human digital designers. It would seem possible, then, for meaning-making members of the digital design Community of Practice to be non-human entities.

¹⁵⁵ Latour, B. (1988) *The Pateurization of France*. Cambridge, MA Harvard Press

Chapter 3 - Speculative Reality

If men were able to be convinced that art is precise advance knowledge of how to cope with the psychic and social consequences of the next technology, would they all become artists? -Marshall McLuhan¹⁵⁶

To Boldly Go

Sir Patrick Stewart wore a wry smile as he stared into the monitor while on a video conference call. On the other end, 400 km in the sky, was Commander Frank De Winne, the Belgian then-commander of the International Space Station. Commander De Winne had requested to speak to Sir Patrick, the English actor who played Captain Jean-Luc Picard of the USS *Enterprise-D* on *Star Trek: The Next Generation*. De Winne had always felt a special connection to Captain Picard--after all, he was the only non-North American to star as the Captain in any *Star Trek* series. Chuckling, Stewart asked De Winne:

"Why would a real astronaut want to meet a fake astronaut?"



Figure 7: The Crew of the ISS

Unfazed, De Winne held a picture up to the viewer. It was a photograph of the six-man crew of the International Space Station--whose members included two Americans, two Russians, a Canadian, and De Winne--all dressed in Starfleet uniforms. Stewart laughed, and told De Winne what a nice job someone had done of Photoshopping the heads of the astronauts onto those uniforms.¹⁵⁷

"No," De Winne replied, "these are us, in uniform. We have them on the station!"

¹⁵⁶ McLuhan, M. (1964) *Understanding Media*, page 71

¹⁵⁷ An Expedition 21 photograph of the ISS crewman wearing Starfleet uniforms, via nasa.gov

Patrick Stewart enjoys telling this story at comic book conventions and science-fiction panels; I've personally heard him tell it twice.¹⁵⁸ It is fairly common, in fact, to hear *Trek* celebrities talk about their connections with NASA. Nichelle Nichols, the actress who played the original *Trek* series' Lt. Uhura, was employed by NASA from the 1970s into the late 1980s as a recruiter for astronauts, focusing particularly on minority and women recruits.¹⁵⁹ Other *Star Trek* actors, such as Scott Bakula and LeVar Burton, have been featured in NASA promotional events and outreach programs.¹⁶⁰ Famously, a letter writing campaign by *Star Trek* fans to President Ford in the 1970s led to NASA christening the first space shuttle to be constructed the Space Shuttle *Enterprise* (although, ironically, the *Enterprise* never actually saw time in space).

The tales above give us a glimpse into how deeply the arts and popular culture can penetrate scientific and technological processes. Whether he is a "fake astronaut" or not, Captain Picard was clearly viewed by Commander De Winne as something of an inspiration, or at least an important enough "historical" figure in space exploration to ask for a conference call with the actor who played him while aboard the ISS. Despite being an American television show, each of the ISS crew members under DeWinne's command were self-admitted *Star Trek* fans according to Stewart, although half of the crew were not North American. The Starfleet uniforms were important enough for the crew to not only be photographed in them, but actually *be taken into space*.

The impact of society and politics on the scientific process and upon technological development has been a focal point of social scientists, and especially within Science and

¹⁵⁸ One at the San Diego Comic Con 2011, and again at the Wizard World Philadelphia comic book convention in 2012.

¹⁵⁹ www.space.com: "Space History Photo: Nichelle Nichols, NASA Recruiter".
<http://www.space.com/24147-nichelle-nichols-nasa-recruiter.html>

¹⁶⁰ NASA.gov article "Final Frontier Astronauts land on Star Trek." Published May 13, 2005. Article archived at: http://www.nasa.gov/vision/space/features/Astros_on_StarTrek.html, last accessed 3/25/2014

Technology Studies, for the past few decades. As mentioned in the beginning of this dissertation, Langdon Winner made famous the argument for the influence of social, political, and economic decision-making on the creation and design of technology in his essay "Do Artifacts Have Politics?," arguing that the overpasses that dot the freeway that leads to the ritzy Jones Beach in New York were purposely designed to keep buses, and therefore lower economic classes, from accessing the beach.¹⁶¹ Following Winner's line of thought, Lelia Green goes as far as to say that the process of creation and acceptance of technology is socially deterministic; that social power determines what types of technology are developed and how popularized they become.¹⁶² Green, in fact, argues explicitly what Winner argues implicitly: that the "social determinist" forces that shape technology are the politically and economically powerful elites in society, those individuals who have access to the funding to both research and build new equipment and interfaces as well as to advertise and market these new technologies to the consumer marketplace.¹⁶³

While, as evidenced in my last chapter, I would disagree with Green's assertion that all technological progress is completely socially determined, the recognition that social, political, and economic forces have causal effects on those that design technology is an important one. Comparatively lacking in social scientific literature, however, is an analysis of the impacts of popular culture upon technically-oriented communities like the digital design Community of Practice. This is somewhat puzzling, as many scholars such as Walter Ong, Marshall McLuhan, and Henry Jenkins have talked about technology's transformative impacts on popular culture. And yet, the other end of the dialectic is left comparatively unexplored by scholars. In what ways can we understand the interaction of astronauts and Starfleet Captains?

¹⁶¹ Winner, L. (1980). "Do Artifacts Have Politics?" in *Daedalus*, Vol. 109, No. 1, Winter 1980.

¹⁶² Green, L. (2002). *Technoculture: From Alphabet to Cybersex*. Allen & Unwin, Sydney

¹⁶³ *Ibid.*

This gap is an important one to explore, particularly so because popular culture is a major actant within the digital design Community of Practice. In this chapter I will argue two major points: first, that the discourse of digital designers reveals that ideas and pop cultural elements, such as design principles and imagined technology, are ontologically real, and have causal effects within the design community. In other words, idea elements have objective properties that have causal powers that exert influence upon the digital design process, and are therefore part of the causal network of digital design.

Second, that the creation of popular cultural objects, particularly via the genre of science fiction, can be in of itself engaging in the process of digital design. It is then possible for individuals who do not actually interact with the material properties of technology to be members of the digital design CoP. This "speculative fiction" that digital designers and artists engage in becomes a form of mutual engagement, the establishment of social and normative bonds within the CoP.¹⁶⁴ The meaning, value, and perceived future of digital art and design, then, is largely a negotiation among the subjective knowledge of human members of the design community, the properties of current and past technology, and the objective knowledge and properties of cultural technologies and characters.

Objective Knowledge, Idea Objects, and Three Worlds

The keynote presentations at SIGGRAPH generally feature a single speaker who is highly respected in the digital arts and design community. These speakers are usually producers themselves, such as visual effects aficionado and filmmaker George Lucas, who gave the keynote in 2005, or game designer and think-tank researcher Jane McGonigal, who spoke in 2012. Unusually, the SIGGRAPH 2013 keynote, "Giants' First Steps," featured a panel of nine

¹⁶⁴ Attwood, M. (1999) "The Handmaid's Tale Summary and Analysis." url: <http://www.gradesaver.com/the-handmaids-tale/study-guide/section9/> Last accessed on 3/25/2014. In this article Attwood notes that the term "speculative fiction" is believed to have originated from Robert Heinlein, who used it as a way to differentiate science fiction from fantasy works.

renowned digital animators, including Pete Docter, director of *Monsters, Inc.* and Henry Selick, director of *Coraline*¹⁶⁵. Each animator spoke about the early days of their careers, careers that for most of the panelists had in the late 1970s or early 1980s. As such, almost every panelist, though they now work in almost exclusively digital media, began their careers as traditional animators; i.e., pen-and-paper, not digital.

Although digital technology substantially changed the production model of animation, each of the artists attributed their continued successes to the storytelling and animation techniques they had learned as traditional animators. Knowledge and use of these techniques, they believed, separated them from the ranks of other digital animators in the industry, who, they argued, had focused too much on playing with technology, rather than story.¹⁶⁶ In an appeal to (greater) authority to support their claims, the panelists played a Youtube video of an interview with legendary digital artist and director John Lasseter, Chief Creative Officer at Pixar. In the interview, Lasseter is asked to give advice to anyone who wants to become a professional digital animator:

The thing I always tell students who want to work in animation... is "do not forget to study the basics." Basic drawing... basic design, basic fundamentals of animation, where you learn the principles of animation, film grammar, ...story, writing--three-act story structure is vital. And you gotta learn all these basics. ...What's important--remember this--software never makes a movie entertaining. It's what you do with the software. And what you do with the software... you'll learn that with the basic fundamentals.

Lasseter's advice to animation students, while practical in design, is ontologically charged. What claims is Lasseter making about the world? Lasseter's foundational claim comes at the end of the excerpt above--that mastery of software alone is not enough to produce an entertaining movie. While, as argued in the last chapter, software and hardware are powerful

¹⁶⁵ "Giants' First Steps", the 2013 SIGGRAPH keynote speech, that featured Ron Clements, Pete Docter, Eric Goldberg, Kevin Lima, Mike Mitchell, Chris Sanders, Henry Selick, David Silverman, and Kirk Wise, and was moderated by Randy Haberkamp. July 22, 2013

¹⁶⁶ *Ibid.*

causal actants within the digital design causal network, they are *causal forces*, not *determining forces*. As evidenced in the quote above, the meaning and entertainment value of movies is additionally negotiated by the designer's employment of understood best practices, "the basics" of animation. By discussing animation principles, such as how characters can move in interesting ways, and "film grammar," such as how to visually frame an animated sequence in a properly communicative way to the audience, Lasseter's quote reveals a new set of causal actants--design principles.

Design principles are incredibly important within the digital design community. They serve as guides and "best practices" for designers to follow. They are meant to make designed objects and art easier to interpret--and therefore understand and operate--for the understood user.¹⁶⁷ Take for example, this excerpt from a "design principles guide" written by Google's Android User Experience Team for designers who are creating applications for Android, the Google-owned operating system for mobile devices:

Delight me in surprising ways: A beautiful surface, a carefully-placed animation, or a well-timed sound effect is a joy to experience. Subtle effects contribute to a feeling of effortlessness and a sense that a powerful force is at hand....

Make important things fast: Not all actions are equal. Decide what's most important in your app and make it easy to find and fast to use, like the shutter button in a camera, or the pause button in a music player.¹⁶⁸

The Android User Experience Team invokes both aesthetical and interactive design principles. The first principle, "Delight me," claims that visually rich graphical environments and minor aesthetic touches like small animations or sound effects can radically, and positively, alter the human experience of a mobile interface. The mobile interface experience can be transformed from the mechanical navigation of one application to the next into "a joy" by

¹⁶⁷ Norman, D. (1988) *The Design of Everyday Things*.

¹⁶⁸ "Design Principles", an article featured on the Android developer blog, written by the Android User Experience Team. url: <http://developer.android.com/design/get-started/principles.html>, last accessed on 3/25/2014

applying design principles. Similarly, the second principle in the excerpt, "Make important things fast," posits that interface functionality that is important to the user for a given application--such as the button that commands the software to take a picture in a photography application--should be predicted by the developer. These predictions should lead the designer to make the most-used elements accessible and fast.

What is most interesting about the invocation design principles is their assumption of universal applicability. What are the enthymematic arguments at play in both Lasseter's and the Android User Experience Team's claims about design principles? When John Lasseter talks about the importance of a three-act story structure, or the aesthetics of proper animation principles, he does not seem to be making a subjective argument. Lasseter is not claiming that he subjectively prefers films and stories to be told in three acts. Instead, he is claiming that three act story structures are, in general, *the best way* to construct a story. The Android User Experience Team is not providing a guiding document for other mobile developers because the team *personally* likes subtle animation in their interface, or easy-to-find buttons. Rather, the Team is arguing that these are near-universal principles to be adhered to when designing mobile interfaces. At the beginning of the "Design Principles" document, the Team even states, "Consider [the following principles] as you apply your own creativity and design thinking. Deviate with purpose."¹⁶⁹ The individual designer's creative decisions have a role to play in the design process, but in negotiation with the rules outlined as "good design." If designers break these rules, *they'd better have a good reason*.

The SIGGRAPH panelists, Lasseter, and The Android User Experience Team are talking ontologically. They are making claims about the objective world. Notice, however, that they are

¹⁶⁹ "Design Principles", an article featured on the Android developer blog, written by the Android User Experience Team. url: <http://developer.android.com/design/get-started/principles.html>, last accessed on 3/25/2014

not exclusively making *material* claims about the world. Rather, the design discourses above are making claims about the objective properties of ideas. Design principles are ideas, but they too, like physical objects, have properties.

Take, for example, the three-act story structure that Lasseter deems vital to good storytelling in animation. The three-act structure has an objective order of events--beginning, middle, and end. Each event has corresponding qualities; the beginning is the Setup, which establishes characters, settings, relationships, and the introduction of a problem. The middle brings the Confrontation, where the protagonist encounters worsening circumstances and encounters a specific, key trial to be overcome. The end phase is the Resolution, where the story reaches its climax, and the protagonist either succeeds and overcomes the trial, or fails.¹⁷⁰

According to Lasseter, the impact of these properties, the causal powers that they exert on the viewer, heavily contributes to a positive audience experience. Others, like author James Bonnet, argue that the causal powers of the three-act structure simplify and water-down storytelling.¹⁷¹ Although they are each making different (and opposing) claims about the *value of the* properties of the structure, they are, importantly, both *making claims about a structure*. And, like the claims about the material properties and powers of technology shown in the last chapter, these ontological claims can be *righter* or *wronger*.

How can ideas have properties, and how can understandings of those properties be more and less correct? As philosopher Andy Clark argues:

When we freeze a thought or idea in words, we create a new object upon which to direct our critical attention. Instead of just having thoughts about the world, we can then make those very thoughts (and thought processes) the targets of more thinking.¹⁷²

¹⁷⁰ Trottier, D. (1998) *The Screenwriter's Bible*. Published by Silman James

¹⁷¹ Bonnet, J. "What's Wrong with the Three Act Structure" url: (<http://www.writersstore.com/whats-wrong-with-the-3-act-structure/>) Last accessed 3/30/2014

¹⁷² Clark, A. (2003) *Natural-Born Cyborgs*. Oxford University Press

According to Clark, when human beings calcify their ideas using text, they create an idea-object, a cultural artifact that has properties and powers that can be critically evaluated. Clark's insights are useful in that they help make clear the distinction between interpretation and thought—interpretation is a performative action, something that individuals and cultures do to understand the world, the objects in it, and their properties. The thoughts that arise as a result of these interpretive acts are themselves objects that can then be interpreted. Clark, however, stops short of truly giving thoughts an existence of their own. For Clark, thoughts about thoughts, which he calls "second-order cognitive dynamics," exist in the mind.¹⁷³ Thoughts never quite become their own entities with power, they change and exist within the individual, subjective world of the human mind, and are therefore bound by the individual mind. This ontology, which is derived from Cartesian dualism, claims that any "power" that idea objects can exert is more metaphorical than real—it is really human beings who exert power in alignment with the thoughts that they cognize and possess.

An issue with Clark's ontological dualism is that it borders on conflating "subjective knowledge," or knowledge in the mind, with "objective knowledge," or knowledge in the world.¹⁷⁴ Lasseter and Bonnet each have subjective knowledge about three-act story structure. This subjective knowledge includes both Lasseter's and Bonnet's subjective value judgments about three-act structure, as well as their understandings of what three-act structure *actually* is. As Karl Popper argues, the objective reality of the properties and qualities of three-act story structure, the *content* of the subjective thoughts that Lasseter and Bonnet have, exists externally from the individual mind.¹⁷⁵ The performative actions that Lasseter and Bonnet make, such as thinking and writing about the three-act structure, cognitively and materially

¹⁷³ *Ibid.*

¹⁷⁴ Popper, K. (1972) *Objective Knowledge: An Evolutionary Approach*. Oxford University Press

¹⁷⁵ "Three Worlds by Karl Popper - The Tanner Lecture on Human Values" - Delivered by Karl Popper at The University of Michigan on April 7, 1978.

actualize the three-act structure. These actualizations, however, are not the same as the idea-object itself. These idea-objects are independent of the individual mind, and have causal powers that impact the way people think.

Levy Bryant's "flat ontology" raises up idea objects where Clark abandons them.¹⁷⁶

Bryant's ontological framework "counts technologies, symbolic entities, fictional entities, groups, nations, works of art, possible beings, artificial entities, and many other entities besides as belonging to the domain of real being."¹⁷⁷ Ideas, thoughts, "fictional entities," and "symbolic entities" are real objects unto themselves that exist in the world outside of the individual human mind. Ideas do not have to be cognized, or actualized, to exist. These idea "objects" have causal properties and powers external to the human beings who perceive and interpret these ideas, can impact human (and other) beings in unexpected and, at times undesired ways, and, like Latour's agents, can *resist* the meanings and interpretations that we try to ascribe to them. The properties of a three-act story structure have impacts upon storytelling. Many of these impacts have been studied by literary scholars, and are known. Three-act story structure may have impacts upon storytelling that are unknown--and may never be known. That does not mean that those properties and their causal powers impacts do not exist or are not real.¹⁷⁸

The three-act story structure that Lasseter references, then, is an existing idea object of the world independent of whether or not Lasseter talks about it, or the students to whom Lasseter is giving advice know about it. Whether they cognize it or not, the three-act structure has influenced countless stories that both Lasseter and Western digital designers in general

¹⁷⁶ Bryant, L. (2011) *The Democracy of Objects*. Open Humanities Press

¹⁷⁷ Bryant, L. (2011) *The Democracy of Objects*. Open Humanities Press, page 41

¹⁷⁸" Three Worlds by Karl Popper - The Tanner Lecture on Human Values" - Delivered by Karl Popper at The University of Michigan on April 7, 1978.

have been enculturated with since childhood.¹⁷⁹ The structure has achieved a tremendous cultural force that all new storytellers must contend with. Similarly, the “fast, easy to press important buttons” principle that the Android User Experience Team advocates exists independently of its actualizations: the interfaces—digital and non-digital—that designers and users have been enculturated to use. Much like the independent status of technology that was discussed in Chapter 2, these storytelling basics and design principles are socially constructed in that they are built by humans, but once they exist, they *exist*, and they *exert*. A Clifford Geertz noted, “man is an animal suspended in webs of significance he himself has spun.”¹⁸⁰

A useful way of describing how idea-objects, the objective knowledge and ideas in the world, exert power upon, but also through, human actors is Popper’s “Three Worlds” model.¹⁸¹ Popper characterizes real objects as belonging to one of three types of “worlds.” World One objects are physical or material objects, events, and processes. Mountains and microchips are physical objects, though one is more “natural” than the other. Material events too, like welding steel or sitting in a chair, are also categorized as World One, as the events themselves (though not necessarily their meanings) are interactions of physical objects. World Two objects are mental objects and processes, ideas and understandings of the world that are processed in the individual mind. An individual’s understanding of the impact of technology on society, their value judgments about the role of government intervention in the marketplace, and creative thinking processes are all examples of objects and events that primarily occur in World Two. The ontological conception of World Three is the most useful for understanding design principles: World Three is categorized by the objective knowledge that resides in the world.

¹⁷⁹ Pattison, D. (2011). “3-Act Structure: Solving a Top-Heavy Problem.” Blog post, url: (<http://www.darcypattison.com/revision/3-act-structure-solving-a-top-heavy-problem/>), last accessed 3/30/2014

¹⁸⁰ Geertz, C. (1973). *The Interpretation of Cultures*. Basic Books, page 5

¹⁸¹ Popper, K. (1978). “Three Worlds.” A Tanner Lecture on Human Values, delivered at the University of Michigan on April 7, 1978

This objective knowledge in the world is irreducible to psychological knowledge held in the individual mind. Popper equates World Three with cultural values and constructions. Specific examples of knowledge in the world include the three-act story structure, film grammar, and design principles that have been discussed in this chapter. It is important to note that Popper does not argue that these "worlds" exist in different realities from one another. These three "worlds," in other words, are all a part of "The World," or objective reality.

Popper's categorizations are not only useful because they give us language to describe the differences among physical objects and individual and shared mental objects. More importantly, Popper's ontology provides a theoretical framework with which to understand the interactions among and flows between these three types of categories. For Popper, objects can exist across the three types of being in different, though linked, states. Popper provides the example of a performance of Shakespeare's *Hamlet*.¹⁸² He argues that the true object of *Hamlet*, the play itself, exists within World Three as objective knowledge. However, *Hamlet* can be actualized in both World One and World Two. Performances of *Hamlet*, written copies of *Hamlet*, film versions of *Hamlet*, and the recordings of performances of *Hamlet* are all material World One actualizations of the primary work of art, World Three *Hamlet*. The mental states that viewers and performers undergo when thinking about, reading, or performing *Hamlet*, individual opinions of *Hamlet*, and an individual mental summary of *Hamlet* are World Two actualizations of *Hamlet*.

Just as the World Three *Hamlet* has causal effects upon and shapes its World One and Two actualizations, these actualizations also have causal effects on World Three. Lawrence Olivier's interpretation of both the play and the character Hamlet differ from Shakespeare's written work, but have done so with such a force that the World Three object, the character

¹⁸² Popper, K. 1978. "Three Worlds." A Tanner Lecture on Human Values, delivered at the University of Michigan on April 7, 1978

Hamlet, has changed.¹⁸³ This is particularly noticeable in Olivier's strong emphasis on Hamlet's implied oedipal complex, a trait that once lurked beneath the surface of the character that has now become a key component of his personality.¹⁸⁴

Hamlet exists and is actualized across all three Popperian types of existence. Similarly, three-act story structure exists and is actualized across these same types of existence. Its existence in World Three is the concept itself. Its existence in World Two are the judgments and ideas about three-act structure held in Lasseter's mind (and, as you read this, your mind as well). Some of its World One actualizations are its presence within a screenwriting textbook, the segmenting of different preproduction storyboards into separate narrative arcs, and the narrative experienced when viewing Lasseter's *Toy Story*.¹⁸⁵

Armed with this conceptualization of idea objects, their causal powers, and their relationships with individual mental states and the material world, we can begin to more deeply analyze specific instances of the digital design thought process, and the invocation of design principles. In the following passage, Cipher Prime's BJ Stallwood is talking through the process of designing a hypothetical "color picker" game mechanic, one that would allow players to select colors from a large color palette. This is a design exercise, one meant to help train digital designers (and Stallwood himself) to think about design principles and the needs of users through brainstorming. In the excerpt, Stallwood is negotiating the properties of good design and usability principles with the properties of the object of play, the potential range of colors in palette, and the properties of the player's controller, which, in this case, is a Nintendo Entertainment System (NES) controller:

¹⁸³n Cinema: Olivier's Hamlet". (1948) Time. URL: (<http://content.time.com/time/magazine/article/0,9171,779905-8,00.html>), last accessed 4/1/2014

¹⁸⁴ Eckert, C.W. (1972). *Focus on Shakespearian Films*. Prentaice Hall Inc.

¹⁸⁵ Sundberg, I. (2013) "Classical Design: Breaking it Down with *Toy Story*," featured on the blog "Ingrid's Notes". url: (<http://ingridsnotes.wordpress.com/2013/06/10/classical-design-breaking-it-down-with-toy-story/>), last accessed 4/1/2014

How about a simple controller like the old-school NES? Chances are, we're going to need the gamepad area for movement. With that in mind, that leaves us with two buttons. If we use one button, we can cycle colors. Cycling colors can be fast if there isn't a range of more than 2-3 colors. However, when you get to 4 or more colors, you'll have to press a button at least 3 times just to get to a specific color. Now you could easily do this, but you'd end up pretty frustrated, and it would be a slower experience. Conversely, you could map both buttons to two different palettes, which will give you up to 6 colors. This could lead to some confusion, but a diligent player will figure it out fast. With two buttons you could even move up or down a list of colors, giving you more granular control of your selection. If you've played Tetris, you can see how being able to spin both left and right came in handy for high level play. Another design solution could be to make one button cycle through colors, while the second button cycles through shades. This will cut down on visual confusion, but also give you at least 6 colors.¹⁸⁶

What material objects, thought objects, and users are being balanced by Stallwood in this piece? On the one hand, Stallwood is describing the material properties of both software and hardware, and talking about what

their impacts on the design process would be. The NES-like controller that Stallwood is describing has a gamepad, or a directional pad (D-pad), that is generally employed for movement or navigation. D-pads are traditionally structured in the shape of a cross, and



Figure 8: The NES Controller

each point of the cross is generally mapped to a corresponding direction. The NES D-pad was usually employed for movement in the four cardinal directions. Although Stallwood is exploring non-traditional ways of using a game controller in a non-traditional game, he concludes that the properties of the D-pad best afford navigational functionality--to use them for radically different purposes would most likely

¹⁸⁶ Stallwood, W. (2013) "'Interface First' Game Design". A post on the Cipher Prime dev blog, posted on May 16, 2013. url: (<http://blog.cipherprime.com/musings/2013/05/interface-first-game-design/>)

confuse the user. The importance of designing systems that are not needlessly confusing for the user is a core tenet of design principles.¹⁸⁷

In addition to the D-pad, Stallwood notes that the controller described has two traditional, single-functionality buttons. On the original NES controller the two circular, red buttons were simply labeled "A" and "B." As evidenced by Stallwood's brainstorming, however, the A/B buttons' simplicity is their strength. Their lack of designer-suggested affordances outside of "Push Me!" encourages Stallwood to think more creatively about the different use possibilities the material properties of these buttons afford.¹⁸⁸ Stallwood mentally maps four different possible use configurations for selecting a color onto the button sets. Each potential use configuration of the buttons is in negotiation with the potential capabilities of the software and the ease of use for the player—different button and software combinations afford greater or lesser amounts of available colors for the player to choose from, but also add greater or lesser amounts of complexity or have operations that take more or less time to perform. Stallwood is trying to negotiate a design solution that allows players to select from the greatest range of colors, in the easiest way possible, while reducing the cognitive load on the user as much as possible.

¹⁸⁷ Norman, D. (1988) *The Design of Everyday Things*.

¹⁸⁸ Herein lies the difference in Gibson's notion of affordances and Norman's notion of affordances. For Gibson, affordances are inherent physical properties of any object; the total range of possible actions that the object can take and of possible actions that can be taken upon the object. A loaded gun, for example, affords the user both the ability to shoot a target and scratch an itch on their back. Even though the designers of the gun (most likely) did not intend for the gun to be used as a back-scratcher, there is no physical reason why the gun could not be used in such a way. For Norman, affordances are the physical "suggestions of use" that are designed into the object by its creators. Under this conceptualization of affordance, the loaded gun, with its ability to fire a destructive, high-speed bullet, affords the ability to shoot a target; there is little to nothing designed into the gun to suggest that it should be used as a back-scratcher, as using a loaded gun as a back-scratcher has a high likelihood of ending badly for the scratch-ee. As you can probably tell from reading the dissertation, I prefer to use Gibson's conceptualization of affordances because it places causal power largely in the physical properties of the gun itself, as opposed to Norman's version, which places causal power solely in the intentions of the designer. And as studies of emergent play in digital games have shown, even the most carefully designed objects afford more possibilities for play and creative use than their designers consciously intend.

Of course, the fascinating thing about this exercise, particularly given our use of Popperian ontology, is that the iterative design process, the implementation, testing, and adaptation of different design solutions, is taking place almost entirely through World Two cognition using properties derived from World Three objects. Stallwood does not have a physical NES controller in front of him that he is programming games for. He is cognizing the properties and potential uses of an abstracted idea of a controller that is derived from World One actualizations of an NES controller. The controller that Stallwood is designing for does not have “Start” and “Select” buttons like NES controllers do. Stallwood is designing using the constraints of a controller that does not physically exist; one that only has a D-pad and two buttons as its interface. The users that Stallwood is designing for also do not exist in World One—they are World Two objects within Stallwood’s mind that follow certain behavioral and cognitive processes. He is able to reason whether or not his users will be frustrated by an interface or not, and whether or not his users have the skill and experience to navigate more complex software and hardware use configurations.

Stallwood has designed, tested, and iterated a digital game, all without touching a computer. The game he designs becomes actualized within World One only through his self-documentation on the Cipher Prime developer blog. Through his written actualizations we are able to also analyze and evaluate the properties of the World Three games that Stallwood has built; the products of Stallwood’s mind that now exist independently of him. Stallwood can also go back to his dev blog record of World Three games designed and use them as reference material and inspiration for new World One games he may be building. These “rapid prototyped” games then may have causal influence upon his next design decisions.

Designers, of course, do not just analyze their own brainstorm and previous development experiences for future design decisions. Chapter 1 discussed how the digital

designer identity is one that straddles the role of producer and consumer. While designers are certainly producers of new creative content, they also tend to be avid consumers of the culture industry. Quotes from Stallwood in Chapter 1 that critically evaluated the camera system and its impact on gameplay in the game *Drive 2* were one example of the prevalence of this dual identity. It is reinforced in the excerpt above; Stallwood refers to Tetris as a causal influence on his design decision-making for his color-picking game. What does Stallwood gain from incorporating Tetris into his blog? Tetris here may act as mutual engagement discourse—a way of creating a shared set of social experiences that helps bind the design community together. Stallwood can connect with his readers by sharing in their love of nostalgic games.

I don't think that's the only thing Stallwood is doing in his post, however. When Stallwood refers to Tetris, he is referring to a simple, often unnoticed game mechanic—the ability to rotate your pieces both clockwise and counterclockwise as they descend. Being able to rotate in either direction could save players up to three button presses when orienting their pieces. At the higher difficulty levels of the game, the time and button presses afforded by mastering this mechanic were often the difference between continuing the level and the “Game Over, Please Try Again <3” screen.

The rotation mechanic in Tetris was simple, elegant, and a core gameplay feature that made the gameplay experience better for players—in essence, an actualization of the application of good design principles. Rarely in the discourse analysis or in my deep hang-outs with designers did I encounter a large amount of abstract design principle talk like the kinds one would expect to find in, say, a college arts and design classroom. Rather, designers tended to talk about design principles, user mechanics, and visual grammar via concrete examples of works of digital art and devices that employed these principles particularly well. The appeals to both the NES controller and Tetris by Stallwood are examples of this. These references, then,

serve to build both mutual engagement as well as shared repertoire within the digital design Community of Practice.

Stallwood's reference to one element of Tetris--the rotation mechanic--as opposed to the entirety of the game to illustrate good design, reflects the tendency of designers refer to and dissect World Three elements that exist within larger World Three pieces. The properties of interfaces, technologies, and characters that exist within cultural memory become referents and casual actants within the digital design CoP. Most often, the World Three objects that have the greatest causal effects upon the digital arts community are those found within the genre of speculative fiction.

Speculative Fiction

In the beginning of their book *Beginning Kinect Programming with the Microsoft Kinect SDK*, programmers and designers Jarret Webb and James Ashley have an almost throwaway comment about the impact of fictional technology on the design world. "What is peculiar," they say, "about *The Minority Report* and before that, science fiction series like the *Star Trek* franchise is that they do not always merely predict the future but can even shape that future."¹⁸⁹ These fictional series, in other words, can have causal impacts on the future development of design. Rather than focus on science fiction however, I believe it is more appropriate to broaden our search for causal impacts of World Three objects to all types of speculative fiction.

What is speculative fiction, and why is it a more appropriate label then, say, science fiction, to describe the cultural forces/World Three casual actants that have a heavy influence on the digital arts and design community? While the definition of speculative fiction can vary author-to-author, in general speculative fiction is an umbrella term that encompasses the sub-

¹⁸⁹ Webb, J. and Ashley, J. (2012). *Beginning Kinect Programming with the Microsoft Kinect SDK*. Apress, 1st edition

genres of science fiction, alternate history, and fantasy.¹⁹⁰ The term is often applied to authors whose works have a strong focus on the creation and explanation of worlds and objects and the material laws that govern these worlds. A detective novel set in contemporary New York City, for example, may not be considered a work of speculative fiction because the author does not have to "speculate" about what life in contemporary New York City. *Star Trek: The Next Generation*, on the other hand, can certainly be considered a work of speculative fiction. Not only did the show's creators have to speculate about life in the 24th century, but *Star Trek* is notorious for their attention to (fictional) technical detail. The show's characters and technologies are constantly constrained by the material, cultural, and political powers and affordances of the properties of their worlds. These properties, of course, were created by the authors of the show. This does not necessarily mean that speculative fiction has to take place in the future of our world; Philip K. Dick's speculative fiction novel *Man in the High Castle* exists in an alternate present where the Axis powers emerged victorious in World War II.

At times, speculative fiction is folded into other genres of popular culture; it is possible, in other words, to find speculative fiction elements in non-speculative fiction. The crime comedy-drama television series *Bones*, for example, while set in the present-day, features a volumetric display device nicknamed the "Angelator." The Angelator is used as a rapid-hypothesis testing machine, and displays holographic animations of victims' bodies and potential ways in which they may have been killed. The detectives in *Bones* are able to manipulate and update the projections in real-time, and the Angelator program has a physics simulator that is so accurate that it can reveal potential causes of death to highly-trained forensic scientists.

¹⁹⁰ Urbaski, H. (2007) *Plagues, Apocalypses, and Bug-Eyed Monsters: How Speculative Fiction Shows Us Our Nightmares*. McFarland and Company

Unfortunately for forensic scientists, the technology necessary to create a piece of equipment like the Angelator does not exist. Current volumetric displays are limited to displaying low-resolution, static



Figure 9: The Angelator from *Bones*

images in a very dark room. The processing time needed for computers to perform the calculations like accurately tracking the trajectory and fragmentation of a bullet in a human body is measured in hours, not milliseconds. The Angelator is a fantasy. While *Bones* itself is not a work of speculative fiction, the Angelator itself is a speculative fiction element embedded within the show.

Speculative fiction has a tremendous influence in the digital design community. Even when using a fairly conservative definition of speculative fiction, speculative fiction was found in forty-seven percent of *Wired* articles (171 out of 361 articles). Speculative fiction references were also made in a large portion of the discourse at both Cipher Prime and SIGGRAPH.

In some cases, speculative fiction was referenced as an illustration of its general impact on both the design community but also upon consumer culture as a whole. In September of 1993, Gareth Branwyn, an editor for geek-culture magazine *boING boING* and contributing writer for Stewart Brand's *The Whole Earth Review*, penned an article for *Wired* that gave a bird's eye view of the state of biotechnology and the future of digital interfaces. The article, titled "The Desire to be Wired," pointed directly to cyberpunk, a sub-genre of speculative fiction, as a major impetus that drove the desires and creation of such technologies:

Just mention "neural interfacing" on a computer bulletin board and you will quickly receive comments like the following: "I am interested in becoming a

guinea pig (if you will) for any cyberpunkish experiment from a true medicine/military/cyber/neuro place. New limbs, sight/hearing improvements, bio-monitors, etc. Or even things as simple as under the skin time pieces." The romantic allure of the "cyborg" seems to captivate the fringes of digital culture... Neural interfacing fantasies have mainly grown out of science fiction, where "add-on" technologies turn people into powerful hybrids of flesh and steel. Since so much of our contemporary mythology comes from SF, an inherent confusion between fantasy and reality is to be expected... Science fiction has fed us so many images of technologically souped-up humans that the current work in neural prosthesis and mind-driven computers seems almost retro by comparison.¹⁹¹

In the above excerpt, Branwyn points out two major causal effects of science fiction upon society: first, the desire, by both consumers and producers, to have the technologies that exist in science fiction pieces be available to them. The hypothetical bulletin board poster in Branwyn's piece yearns to turn her body into the types of romanticized cyborgs she has read about or seen in cyberpunk fiction. While she seems to prefer that a research lab graft new limbs or some sort of superhuman enhancement onto her body, she will settle for a sub-dermal watch, an imbedded timepiece that displays the time through her skin, removing the hassle of having to put on and take off a watch every day. She does not state any specific medical needs that she desires to have fixed; rather, she simply seeks augmentation, in any degree.

The second causal impact of science fiction that Branwyn posits above is the inevitable disappointment of consumers when available biotechnology does not match their expected standards of quality and usefulness. Branwyn calls this "an inherent confusion between fantasy and reality [that] is to be expected."¹⁹² If our hypothetical augment-desirer wants to have better-than-human hearing, for example, she may be disappointed to learn that cochlear implants, even today, only transmit a small fraction of the frequencies a healthy human ear can perceive to the brain. Most bio-augments, in fact, are not "augments" at all, but decidedly inferior to functioning human biological equipment. Later in the piece, Branwyn explains how

¹⁹¹ Branwyn, G. (1993) "The Desire to be Wired." Featured in the September, 1993 issue of *Wired*

¹⁹² *Ibid.*

the material and economic hurdles that scientists, engineers, and designers must navigate imposes constraints upon the creation of technology; constraints that science fiction authors and artists may divest themselves of. Still, it is science fiction that heavily influences designers and scientists to desire to build these interfaces *in the first place*. Once again we can see the negotiation of World One, Two, and Three objects--material, cognitive, and cultural nodes in a causal network--that occurs in the digital design process. While the World One actualizations of World Three science fiction objects may not live up to expectations, these unfulfilled expectations also create an impetus to continue refining the World One technologies.

In general, Branwyn is arguing that the cultural objects and stories told via speculative fiction create technological goals for designers, scientists, and consumers. People want to build and to buy what they see in pop culture. A recent commercial for the Samsung Galaxy Gear smartwatch plays off of this idea.¹⁹³ The "Evolution" commercial shows a series of speculative fiction wrist-mounted technologies that allow for video or voice communication, including the *Dick Tracy* radio watch from the 1940s, the *Inspector Gadget* television-watch from the 1980s, and a *Star Trek* wrist communicator from the 1979 film. At the end of the commercial, a model of the Galaxy Gear is shown, along with some of its basic functionalities like taking a phone call and touchscreen interface. Flashed across the screen are the words: "After all these years, it's finally real."

While I would quibble with Samsung's ontological claim that the World Three wrist communicators aren't real (clearly they have some causal effects on the Galaxy Gear), the key to the commercial is Samsung's attempt to sell their product as a World One actualization of these World Three objects. There is very little information in their ad campaign about the actual functionality or specifications of the Galaxy Gear apart from "it looks like *The Jetsons*."

¹⁹³ "Evolution," a commercial for Samsung's Galaxy Gear smartwatch, released in 2013

Interestingly enough, the Galaxy Gear sold relatively poorly, and it was reported that 30% of consumers who bought the Gear at Best Buy returned it.¹⁹⁴ Many of the complaints centered around the fact that the Gear did not work as well as consumers were expecting it to; expectations put in place because of the World Three "smartwatches" consumers had seen in speculative fiction.¹⁹⁵ In the case of the Galaxy Gear it would seem that Branwyn's arguments are validated: the consumer desire for the smartwatch was fomented by popular culture and speculative fiction, but the actualization of the smartwatch has failed to live up to the expectations of the speculative fiction object.

It should not be surprising to see such a prevalence of speculative fiction references within digital arts and design discourse. Digital designers are also consumers and, as noted by Branwyn, speculative fiction has a heavy impact on contemporary mythology and technology. More importantly, the work of digital designers, particularly those who design primarily for animation or gaming, often plays an important role in the creation of new speculative fiction. Visual effects artists develop the look and design of imagined technology in movies and television; technology that may then become a beacon for future technological development. If speculative fiction is a genre in which authors are very concerned about the properties and constraints of the imagined world that they create, then game designers are speculative fiction authors, in that they *literally* create the properties and mechanics of their gameworlds, and all of the characters, objects, and events that take place within that gameworld must adhere to the affordances and constraints that the gameworld possesses.

However, the majority of the articles in *Wired* that referenced speculative fiction were not designers talking about their own work. Eighty percent of the articles that cited speculative

¹⁹⁴ Amadeo, R (2013). "[DOA: The Galaxy Gear reportedly has a 30 percent return rate at Best Buy](#)". Ars Technica. Last accessed 4/6/2014

¹⁹⁵ *Ibid.*

fiction elements (a total of 137, or 39% overall) used speculative fiction as a design reference; i.e., speculative fiction was used as a model for current design goals or as a way of thinking through a particular design problem. This use of speculative fiction in *Wired* reflects BJ Stallwood's use of *Tetris* and the NES controller as referents for design shown earlier in the chapter, as well as data from conversations at SIGGRAPH. In my observed discourse, the causal impacts of World Three speculative fiction elements upon digital design tended to fall within one of three categories: as aesthetic and meaningful inspiration, as a model for usability and interface design, and as an ethical guideline.

Aesthetics

In 2012, New York-based filmmaker Kirby Ferguson released a documentary titled "Everything is a Remix," a film that has stimulated some conversation and controversy within the art and design worlds. Ferguson's thesis is a simple one: that all the products of the human mind, particularly artistic products, are copied, transformed, and recombined pieces of older artistic works and thoughts. For Ferguson, nothing is purely original:

The act of creation is surrounded by a fog of myths, myths that creativity comes from "inspiration," that creativity breaks the mold, is the product of geniuses, and appears as quickly as electricity can heat a filament. But creativity isn't magic. It happens by applying ordinary tools of thought to existing materials. And the soil from which we grow our creations is something we scorn and misunderstand, even though it gives us so much. And that's copying.¹⁹⁶

While Ferguson's rhetoric is certainly dramatized, I believe his overall point to be a strong one: that artistic inspiration does not only come from within the individual artist or designer, but from the artistic elements with which the artist has previously engaged. Ferguson is arguing along a similar vein as this dissertation--that the objects of existing art and cultural

¹⁹⁶ Ferguson, K. (2012) *Everything is a Remix*

ideas have a causal effect on the future production of art. New media theoreticians like Henry Jenkins and Lawrence Lessig have called this type of artistic production "Remixing."¹⁹⁷

The impact of the causal effects of World Three speculative fiction elements is perhaps most obviously seen via the aesthetics of digital design. While aesthetics is colloquially used to refer to the styles and "feelings" of art, philosophically aesthetics also incorporates human the human understandings of and sentiments about art and "beauty."¹⁹⁸ Aesthetics, then, is both the look of and *meaning attributed to* works of art. The aesthetics of remix, of course, is not limited just to digital art. Costume designers Ralph McQuarrie and Norman Reynolds, for example, famously modeled the design of *Star Wars's* golden android C-3PO after the golden robot Maria from Fritz Lang's 1927 film *Metropolis*. The US government's newest laser-rifle prototype, the "Personal Halting and Stimulation Response" rifle--or PHASR--not only looks like the phaser rifles from the *Star Trek: The Next Generation* films, but was anagrammed after them as well.

From the digital design Community of Practice, Bre Pettis, a main developer of MakerBot's "Replicator 2," one of the first commercially available, mass-produced 3D printers, attributed the look and design of the Replicator to a remixing of speculative fiction styles. Chris Anderson covers Pettis's design inspirations in the September 2012 issue of *Wired*:

Unlike the jerry-built contraptions of the past, the Replicator 2s are sleek, metal, and stylish: MakerBot CEO Bre Pettis likens the design to "Darth Vader driving Knight Rider's KITT car while being airlifted by a Nighthawk spy plane." There is also the lighting. Oh, the lighting. "LEDs are part of our core values as a company," Pettis jokes. The new machine will glow in any hue—"to match the color of your couch," he says, "or like something in the movie *Tron*."¹⁹⁹

¹⁹⁷ Jenkins, H. (2005) *Convergence Culture*. and Lessig, L (2009) *Remix: making Art and Commerce Thrive in the New Economy*

¹⁹⁸ Zangwill, N. (2003) "Aesthetic Judgment." *Stanford Encyclopedia of Philosophy*

¹⁹⁹ Anderson, C, (2012) "The New Makerbot Replica Might Just Change Your World," Featured in *Wired* September 2012

Pettis explicitly cites four speculative fiction elements as being in negotiation with the design of the Replicator 2: *Star Wars's* Darth Vader, KITT from *Nightrider*, the planes from *Nighthawk*, and the glowing LED-like technologies and styles from Disney's *Tron*. Implicitly, the name "Replicator" itself is derived from the replicators on *Star Trek*, the box-shaped matter generators that provided food, clothing, and equipment for Starfleet crew members.

Speculative fiction would seem to serve two functions for Pettis and the Replicator. First, speculative fiction elements clearly had a causal effect on the look of the Replicator. More importantly, however, I would argue that the aesthetics appropriated from speculative fiction are designed to contribute to the user's meaning-making about the Replicator. The "space-age" look inspired by the veneer of 1980s sci-fi television and movies suggests to the user that this technology is meant for more than just printing out spare parts to fix your kitchen drawers. The Replicator will glow to "match the color of your couch" and to invoke memories of *Tron*, a film where the human user had god-like powers to create and manipulate within the computer world. Pettis wants the consumer to view the Replicator as a necessary tool for the future, one that allows for both mundane production as well as near-limitless creative work.²⁰⁰

The Replicator "remixes" and is itself a remix of objects on several levels. The World One material design of the Replicator is a remix of imagined objects and technologies that exist within cultural memory, i.e., World Three, though these objects are actualized in film and on television in World One. The properties of the World One Replicator are designed to evoke the memories and understandings of the World Three objects they reference within the user. The user's understanding and constructed meaning of the Replicator 2, then, is in itself a "remix" of the properties of imagined objects--World Two objects, or the individual ideas, understandings, and value judgments of material and cultural objects. The meaning of the Replicator is a

²⁰⁰ *ibid.*

negotiation of objects in cultural memory, the individual understandings of these objects by both designers and consumers, and the physical properties of the material actualizations of these objects. In other words, the Replicator is designed, actualized, and made meaningful within a casual network of actants across Worlds One, Two, and Three.

At SIGGRAPH, Robert Michael Smith also cited the properties of speculative fiction as both aesthetic inspiration for his work as well as a foundation for viewers to understand his work. We began talking about Smith's biosculptures in Chapter 2, sculptures designed using digital 3D modeling software, the physically substantiated using 3D printed organic tissue, which is kept alive by having blood pumped through it by a dialysis machine.²⁰¹ In a future phase of the project, Smith hopes to connect the biosculpture to an artificial intelligence machine that will allow it to react to external stimuli. When discussing his work, Smith continually referred to the influence that both speculative fiction and the writings of futurists--particularly Ray Kurzweil--have had on him throughout his twenty-year career and that has culminated in his current project. The aesthetics and ideas found in cyberpunk and biopunk fiction, particularly the idea that living matter can both be augmented with mechanical components as well as be raw building material for new forms of human- and machine-engineered life is a particularly salient for Smith's work. The look and feel of his biosculptures are deeply connected with these pieces of speculative fiction.

As is the intended understanding of Smith's work. As mentioned earlier, Smith references the writings of Ray Kurzweil as an influential actant in his work. Kurzweil is currently a director of engineering at Google and played a major role in the development of human-computer interactive software in the 1970s and 80s. Kurzweil is also a futurist, an author whose

²⁰¹ Robert Michael Smith spoke at a panel presentation alongside Daniel Collins, John William Penn, and Don Vance on the potential impacts of 3D printers on July 21, 2013 at SIGGRAPH 2013 in Anaheim, CA. The panel was titled "The Bleeding Edge of 3D Printing and Digital Fabrication."

job is to take his knowledge of the material and cultural conditions of the present and prognosticate them into the future. While you will find Kurzweil's books in the non-fiction section, Kurzweil is, in fact, engaging in the creation of fiction. Kurzweil builds the imaginary worlds of tomorrow based upon the material conditions of today. He speculates on the potential impacts the properties of those conditions will have upon the future. The worlds he builds have properties and constraints that afford Kurzweil, and others, the ability to then prognosticate even farther into the future. Whether or not he would admit it, Kurzweil is, in fact, a speculative fiction author.

One of Kurzweil's most famous quotes is "Live long enough to live forever," taken from his book *Fantastic Voyage*, co-authored with medical doctor and alternative medicine specialist Terry Grossman.²⁰² In this futurist speculative work, Kurzweil argues that the path of human evolution is not exclusively biological, but will be forged via the synthesis of biological and technological systems. Kurzweil posits that the human body will soon be so connected with external mechanic devices and so flooded with internal nanodevices that the line between human and machine will disappear. Along this line of argumentation, Kurzweil believes that the machines incorporated with our bodies will repair cells, heal injuries, and cure diseases, effectively making human beings immortal. Kurzweil also believes this technology will come about in the next fifty-or-so years, hence "live long enough to live forever."

Smith desires that audiences viewing his biosculptures understand them through this cyberpunk/posthuman/transhuman aesthetic. The sculptures themselves are combinations of biology and technology, imagined within and created by a machine, instantiated in biological matter, and kept alive and given movement through mechanical and digital means. Smith states, however, that in the future he hopes the sculptures will give him a kind of immortality--

²⁰² Kurzweil, R. and Grossman, T. (2004) *Fantastic Voyage: Live Long Enough to Live Forever*. Rodale Books

current Internal Review Board restrictions prevent him from using his own genetic information as the foundation for the bio-matter that is used to materially build the sculptures. Smith hopes to overcome these restrictions. If he does, future biosculptures will be created that have his genetic signature, his DNA. They will be, from a certain aesthetic, a part of himself, a part which may live on after he passes thus--in a way--extending his life.

Again, these biosculptures are digital remixes. They are a remix of digital, mechanical, and biological objects. They are a remix of physical properties (World One), individual values and understandings (World Two), and broad cultural objects (World Three). They are a remix of blood, bytes, and beliefs.

Usability

One of the major new technologies that *Star Trek: The Next Generation* introduced to the *Trek*-verse was the Personal Access Display Device, or the PADD. The PADD was a thin, lightweight, rectangular computing device, most often seen in use by members of the Federation. It featured a large video display, touch-based interaction, and the ability to wirelessly network with other PADDs or other larger computer terminals. Every member of Starfleet had access to at least one PADD, which were used for work on starships, to read up on recent news and reports from around the galaxy, to listen to music, watch video, and even write creative stories or journal entries. The PADD, in other words, was an iPad 15 years before the iPad was the iPad.



Figure 10: The *Star Trek* PADD and the Apple iPad²⁰³

The point of talking about the PADD is not to claim that Apple and other tablet manufacturers stole the idea from *Star Trek* (Kirby Ferguson would use the more playful term "copy"). Nor is it to claim that the concept for tablet computers originated with *Star Trek* set designers in the 1980s. Rather, the PADD is an example of a design dynamic that digital artists undergo when creating experiences that must be navigated by the user--"intuitiveness".

You will often hear well-designed interfaces and devices referred to as "intuitive" by marketers and technology reviewers. In this case, an "intuitive" interface is one that a human user will naturally understand how to use; the device is so well designed that its form essentially directs the user to use the device in the way the designer intended. Human-machine interaction theorist Donald Norman claims that the goal of designers should be to create "well designed objects [that] are easy to interpret and understand. [These objects will] contain visible clues to their operation."²⁰⁴ The form of the objects, in other words, should be intuitive.

You won't find the word "intuitive" very often in Norman's writings, or the discourse of many professional designers. This is because designers understand that "intuitiveness" is a

²⁰³ The PADD vs. the iPad, taken from "Bob Canada's Blogworld", first published online in May 2010. Link last accessed 4/7/2014 at (http://4.bp.blogspot.com/_-H0iU3MMc1s/S-jBjWEsc6I/AAAAAAAAABus/q-quTn3rWdw/s1600/padd.jpg)

²⁰⁴ Norman, D.A. *The Design of Everyday Things*, Basic Books, page 2

myth.²⁰⁵ While it is true that the affordances and physical properties of a design or interface can be better or worse at suggesting how the interface is intended to be used, the users are more likely to use the device as intended if they are familiar with the style of interface used. Devices are rarely, if ever, naturally intuitive. Rather, they are more or less *familiar*.

For example, the familiar control device for movement in PC gaming is to use the "W," "A," "S," and "D" keys for navigation. While the physical properties of the keyboard hardly suggest the WASD navigation scheme, it has been such a staple of gaming culture for the past two decades that most PC games will use WASD as their default control scheme. It is also important to note that usability familiarity is not limited to "interactive" interfaces; the use of three-act story structure by Pixar is itself a familiar "interface." The audience understands how to "use" and interpret Pixar films; not only is three-act story structure fairly easy to follow, but Western audiences are so accustomed to stories told in three acts that they are able to easily grasp the flow and pacing of films that use three-act structure. Again we see the causal influence of World Three objects (three act story structure) and their World One actualizations (*Toy Story*) upon World Two value judgments (audience understanding and interpretation). Also note that digital designers may design interfaces based upon World Three technologies for other World Three objects. The computer interfaces created for James Cameron's 2009 film *Avatar* drew heavy inspiration from both World One objects, such as the iPad, and other World Three technologies, like the holographic displays in *Minority Report*.

The *Trek* PADD is important to the iPad not only because it arguably impacted the aesthetics of the iPad, but because *Star Trek* trained designers and consumers to understand how tablets work *before tablet computers existed*. Or, at least, before tablet computers existed in World One. Speculative fiction, in other words, has a causal impact on the way that designers

²⁰⁵ Raskin, J. (1994) "Intuitive Equals Familiar." *Communications of the ACM*, 37:9, September 1994, page 17

design their interfaces. Designers saw Starfleet officers interacting with PADDs on the show, saw them using screen-based touch interfaces and relaxing by reading the news in their quarters on their PADDs. In doing so, they began to build a grammar of usability for tablet computers, a grammar that was applied to the interfaces they designed and happily used by the consumers designers designed for, because the consumers had internalized this usability grammar as well.

While you would be hard-pressed to get Apple interface developers to say that the PADD had causal impact upon their design decisions, many designers are quite explicit about the effects the properties of imagined technology have had on their own work. The Microsoft Kinect, the camera-input device that uses player body movements as a control mechanism released in 2010, is heavily compared to an control interface from the 2002 film *Minority Report*, which itself is based off a 1956 Philip K. Dick short story. In the film, main character John Anderton, played by Tom Cruise, navigates through various media elements on a holographically-projected screen by making sweeping arm and body motions, augmented by a glove controller. When describing the Kinect in his programming and design guidebook, Jarret Webb bemoans: "At one point I insisted to my co-worker that we try to avoid ever using the words "minority" and "report" together on the same page. In this endeavor I have failed miserably and concede that avoiding mention of *The Minority Report* when discussing Kinect is virtually impossible."

Indeed, reviewers and consumers of the Kinect immediately began referring to it as "the *Minority Report* interface" immediately upon its release.²⁰⁶ As Gareth Branwyn predicted at the beginning of this chapter, however, when users and designers compare the World One actualizations of the promises of World Three technologies, they are often left disappointed.

²⁰⁶ Molina, B. (2010). "We play Kinect...". USA Today. November 4, 2010

While the Kinect worked well enough, some of its functionalities, like scrolling through media, were messy and clunky compared to the interface seen on the big screen.

The June 2012 issue of *Wired* features a story written by Roberto Baldwin who interviews Ben Heck, an amateur designer and developer who makes mods for computer hardware and posts his creations on Youtube. In the video interview associated with the article, Heck talks despairingly to Tom Cruise's photograph on the cover of the *Minority Report* DVD:

Tom Cruise, why have you forsaken me? You promised a future that was full of motion controls and wonderment. But [the Kinect] is what we get. Well, maybe it's up to me. Maybe I should build a *Minority Report*-type glove, that can control game console media the way we always hoped it would be. Yes. I should. So I will!²⁰⁷

Heck then takes viewers through a step-by-step process of designing, building, and implementing a *Minority Report*-style glove that works with the Xbox 360's media center. Heck is a prosumer--a producer-consumer--and one that uses his digital design skills to implement a fix to a problem he perceives exists within the Kinect's user interface. Of course, the source--and solution to--the problem is his understanding of how the Kinect *should work*, not how it *does work*. And it should work like *Minority Report*. World One *should work like* World Three.

It should be noted that designed interfaces are not always trying to be direct copies of imagined interfaces seen in popular culture. When designers try to implement copies of imaged technology, it is generally because they believe that it is at least *possible* to achieve a "good enough" actualization of that imagined technology in the material world. The Kinect might not work as well as the interface from *Minority Report*, but it is still a very serviceable control interface in its own right. The iPad is in fact in almost every way an *improvement* on the PADDs

²⁰⁷ Baldwin, R. (2012). "Xbox 'Power Glove' Offers Precise, Kinect-Like Gesture Control." featured on Wired.com, 6/7/2012. The video link in the article where the above quote is taken from is from "The Ben Heck Show" "Xbox power glove" episode, hosted on Youtube

shown in *Star Trek*. Sometimes, however, designed technology is used to simulate what is seen to be impossible in speculative fiction. To allow the user to experience fantasy--technologically.

The "AquaTop" display, developed by designers at the University of Electro-Communications in Tokyo, is a game interface that allows users to interact and play with objects projected onto the surface of water.²⁰⁸ The AquaTop team had a functioning demo of their research on display, in a bathtub, at SIGGRAPH 2013 that attendees were free to play. One of the games available to play on the AquaTop involved players shooting balls of energy from their fingers and hands at an enemy rubber duck that floated at the other end of the tub. They players had two types of energy blasts they could use--by sticking one of their fingers up through the surface of the water, they could create a small circle of energy that they could "flick" at the duck. These energy balls were fairly weak, but allowed the user to fire eight of them--one for each finger--at the duck at a time. To use the other type of energy blast, players had to cup their hands together just beneath the surface of the water. When they did, a small ball of energy would begin forming in their cupped palms and would grow larger and larger the longer they held their hands together, accompanied by rising sound effects emanating from the tub. When the player had fully "charged" their shot, they could release it at the duck, which, upon contact, would explode in a burst of light and bubbles.

As I watched new players walk up to the tub to try out the game, few had any trouble discovering the cupped-hands functionality, and some new players, especially those who came in groups, would yell "Kamehameha!" at the rubber duck as they fired their energy blast. For readers who aren't fans of Japanese anime, the "Kamehameha Wave" is a charged energy blast used by several of the main characters in the *Dragonball* sci-fi/fantasy martial arts anime series, which is popular in both Japan and the West. *Dragonball* characters use the Kamehameha

²⁰⁸ The AquaTop Display was developed at The University of Electro-Communications in Tokyo, Japan by Yasushi Matoba, Yoichi Takahashi, Taro Tokui, Shin Phuong, Shingo Yamano, and Hideki Koike

Wave by cupping their hands together, slowly focusing their body's mystical energy called "qi" into their hands, and then releasing a great ball of energy at their enemy while yelling "Kamehameha!"

Not only did players make reference to *Dragonball* when they discovered that they had the ability to focus energy in the AquaTop game by cupping their hands, they--more importantly--tried out cupping their hands *in the first place*. Players were familiar with the mechanics of firing mystical energy from your hands at enemies. It was intuitive to them, it was familiar. And it was familiar, of course, because many of the players at SIGGRAPH, who themselves were designers, and the developers of the AquaTop game shared a common cultural knowledge of how to shoot energy blasts from your hands through *Dragonball*.

So far I have shown how digital designers often mimic or simulate the interfaces that they encounter in speculative fiction, either to actualize these interfaces in World One or to create familiar-looking interfaces in other World Three works of art. My last argument about the impact of the properties of World Three objects upon digital designers is that designers, in fact, undergo a process of the discovery of the imagined technologies before they begin to actualize or simulate them.

This may seem like an obvious point. In order to mimic an interface designers have to understand the interface. What I am arguing, however, is that these World Three objects have objective properties--and that designers must discover the properties that make these World Three objects useable to the characters in their fictional worlds in order for these interfaces to be helpful to them as interactive schema for their users. Not only does the discovery of these properties help designers build better systems, the discovery process also allows designers to communicate design principles to one another.

In their book *Make It So*, designers Nathan Shedroff and Christopher Noessel carefully examine the design and interaction properties that can be found in several different science fiction technologies.²⁰⁹ A strong example of making discoveries about the objective properties of speculative fiction technology arises when Shedroff and Noessel look at the volumetric communications displays used in *Star Wars* and ask, "What makes this work?" Shedroff and Noessel are not asking a technical question. They are trying to figure out what, exactly, makes the volumetric display desirable to use for the characters in *Star Wars*? What interface successes afford a miniature, transparent, blue, glowing Leia the ability to beseech: "Help me, Obi-Wan Kenobi. You're my only hope."?

Shedroff and Noessel make a major discovery about the properties of the volumetric projections (VPs) in *Star Wars* that enhance their effectiveness: VPs are socially aware. VP software understands culturally appropriate body language and makes alterations to the displayed avatars of the communicators to account for this. For example, Shedroff and Noessel note that in *Star Wars: Episode Three*, the VP communication system is intelligent and socially aware enough to adjust the displayed figures of Darth Sidious and Commander Cody so that they appear to be looking at each other, when in fact the position of their heads as they talk to the VP device would never allow them to actually make eye-to-eye contact: "A comparison of the images [In *Episode Three*] shows a mismatch in the speakers' positions: Commander Cody looks down into the eyes of a miniature VP Sidious, who is looking up at him, and the real Sidious is looking horizontally at the projection of Cody, who looks horizontally back at him."²¹⁰

²⁰⁹ Shedroff, N. and Noessel, C. (2012) *Make It So: Interaction Design Lessons from Science Fiction*. Rosenfeld Media, LLC

²¹⁰ *Ibid*, page 84. The images shown here are the same images used in *Make It So*, and are property of Disney-Lucasfilm



Figure 11: A Holographic conversation between Darth Sidious and Commander Cody. Note the difference in head positioning between Cody's real body and his projection to Sidious

In order for communication to happen "intuitively," it seems that it was important for the fiction designers of the VP system to ensure that users were always making eye contact with one another, even if that means changing the body position of the VP. Shedroff and Noessel discover that the imagined designers of the VP system (and, consequently, the digital designers at ILM who developed the graphics for the VP system) felt that it was more important for the VP to be *socially* accurate than to be *physically* accurate.

Shedroff and Noessel also discover that larger *Star Wars* VPs are also capable of reinforcing social hierarchy. Again, the imagined software running the World Three VP exhibits social awareness:

Another aspect of the *Star Wars* VPs becomes apparent when we compare those used by the Empire and those used by the Jedi. The Empire's VPs are almost always shown scaled, with superiors scaled larger than their subordinates. The Jedi Council, in contrast, reinforces its egalitarian principles by making sure that, where possible, VPs in live deliberations are sized to appear as they would in real life.²¹¹



Figure 12: Two forms of social hierarchy as expressed through hologram

²¹¹ *Ibid*, page 84. The top image shown is the same image used in *Make It So*, while the second image is taken from the *Star Wars: Clone Wars* television show. Both are property of Disney-Lucasfilm

When digital designers undergo processes of discovery about the imagined technology they see in speculative fiction, they learn not only about the properties of that World Three technology, but also about the properties of the world that technology exists in. They learn to become aware of the interplay between the casual powers of culture and technology, lessons that can be applied to their own design work. For example, later in the chapter Shedroff and Noessel talk about how to apply socially aware technologies in American culture. One of their brainstorms is to use scale as a measure of popularity, such as displaying the more popular singer in *American Idol* as a larger volumetric projection. Importantly, the discovery of the properties of imagined technology allows for designers to discover the thought processes and design principles employed by other members of the digital design community--particularly when the World Three technologies are visualized in film or on television, as opposed to written about in a book. Speculative fiction is a venue for digital designers to build techniques and shared repertoire with one another across foci--Shedroff and Noessel are primarily software and interaction designers, and are learning interface and design principles from the artists at ILM, who are predominantly 3D modelers and animators.

Ethics

In the epigraph at the beginning of the chapter, Marshall McLuhan argues that "art is precise advance knowledge of how to cope with the psychic and social consequences of the next technology."²¹² Judging from how digital designers appropriate and are impacted by the technologies depicted in speculative fiction, it would seem that McLuhan is on to something. The PADD influenced the way that consumers and designers thought about the future of handheld computing, and *Minority Report* showed us how to interact with computers using motion controls. These artistic World Three technologies became "precise advance knowledge"

²¹² McLuhan, M. (1964) *Understanding Media*, page 71

of the form and function of future technology, largely because they became a part of the causal forces that shaped the development of the next technology.

Speculative fiction does more than just working with designers to mold the looks and interfaces of future design. It also helps shape the politics and ethical viewpoints of designers. More specifically, speculative fiction acts as a negotiator of the meaning of what technology *should be*, and what technology *should do*.

In her book *Cyberselfish*, Paulina Borsook, a journalist at *Wired* during its pre-dot-com burst heyday, writes about the staunch techno-libertarian attitudes that pervaded the *Wired* offices as well as the digital design community as a whole in the 1990s.²¹³ This techno-libertarian attitude tended to take one of two forms: one, a general attitude that newer, better technology was the solution to all the world's economic, political, and social ills; or two, that those who embrace digital technology, particularly the World Wide Web, will move beyond the constraints of the material conditions of the real world. The latter attitude is exemplified in John Perry Barlow's 1996 manifesto "A Declaration of the Independence of Cyberspace," which declared cyberspace an independent nation of individuals, a nation that did not exist in the physical world, and was therefore not subject to or bound by any laws that govern the world.²¹⁴ For Barlow and other 1990s freedom-seeking "cypherpunks," technology is a tool used to free people from bondage, and technology itself desires to be free.²¹⁵

While the latter strain of hyper-libertarianism embodied by Barlow seems to have largely receded from design discourse, its remnants, the desire for technology to be "free," have intertwined themselves with the "curing of social ills" belief system. Contemporary design

²¹³ Borsook, P. (2000) *Cyberselfish: A Critical Romp Through the Terribly Libertarian Culture of High-Tech*. Public Affairs Publishing

²¹⁴ Barlow, J.P. (1996) "A Declaration of the Independence of Cyberspace."

²¹⁵ Borsook, P. (2000) *Cyberselfish: A Critical Romp Through the Terribly Libertarian Culture of High-Tech*. Public Affairs Publishing

techno-libertarian discourse often invokes the thesis: "technology wants to be free so that it can act as a liberating force to free us." As industrial designer Yves Behar tells *Wired* in 2012:

Design wants to be free, to paraphrase Stewart Brand. And when I say "free," I'm talking about the broadest sense of the word—meaning both low-cost and liberated.... Design no longer signifies high priests at their drafting tables but rather you and me at our computers... We have become participants on social platforms that allow us to collaborate and customize and create, and in the process we've become expert collaborators, customizers, and creators... This ever-more-free design is speeding the adoption of new ideas, which in turn disrupt old industries. Designers, coders, and entrepreneurs are challenging notions that sustainability is expensive, that technology is hard to use, that quality is exclusive. No segment of the economy will be left untouched.²¹⁶

Our friend Stewart Brand arises again. If you recall from Chapter 1, Brand, a founding contributor and major ideological influence on *Wired*, wrote that "We are as gods and we might as well get good at it."²¹⁷ Humanity, in other words, has the power to shape nature and the world as we see fit, so we should get good at being able to do so. Yves Behar argues in the excerpt above that the democratization of design is the event that will allow human beings to change the way the world works. Observe the ontological claims that Behar is making: the ability to digitally design is making everyone more creative and collaborative. Digital technologies are disrupting old centralized systems of industry and production. New design tools are making sustainability less expensive, in effect helping to save the environment. Technology is easy to use. Quality products can come from even the smallest producers. Everyone is an expert.

This is the face of modern techno-libertarian discourse in the digital design community. Digital technology can free everyone because everyone can use digital technology. Collaboration can replace governments and old-world industry, and science can fix nature.

²¹⁶ Behar, Y. (2012) "Design Wants to be Free." Featured in the September 2012 issue of *Wired*

²¹⁷ Brand, S. *The Whole Earth Catalog*

Where does this libertarian influence come from? *Wired* itself, of course, is one source within the digital design community that proliferates this ideology that it inherited from Brand. The techno-libertarian ideology is also one that fits nicely with the practical work and thought processes that designers engage with. Designers are problem solvers. They are presented with problems, whether those are technical problems (Elizabeth isn't assisting the player correctly), aesthetic problems (the shine on Darth Vader's helmet is coming from the wrong direction), or storytelling problems (I don't understand a character's motivations). Digital designers find solutions to these problems largely through employing and manipulating technology--whether that is writing a better AI script, adjusting the specular highlights on a helmet, or changing a character's color palette to make them appear more sinister. It would make some sense, then, that designers' first instinct would be to apply that same logic of technological problem solving to social, environmental, and political problems they encounter.

Borsook suggests an additional reason. Borsook invokes psychologist James William Gibson' notion of the "New Warrior" subculture as being a pervasive element in the male dominated tech industry of the 1990s. The New Warrior subculture, according to Gibson, is a post-Vietnam conceptualization of Western masculinity that prizes the rugged individual, the lone warrior who is self sufficient, can "live off the grid," and resists any attempts by power structures--particularly government--to constrain him.²¹⁸ Borsook claims that tech culture absorbs this New Warrior mentality through the speculative fiction works that they encounter; she in particular names Philip K. Dick, Robert Heinlein, William Gibson, and Ayn Rand as the primary authors that contribute to the New Warrior speculative fiction genre.

²¹⁸ Gibson, J.W. (1994) "Warrior Dreams: Violence and Manhood in post-Vietnam America" Hill and Wang Publishing

Borsook continues to say that those in the digital tech industry "act like Luke Skywalker taking on the Empire."²¹⁹ The role models and ethical influences upon the digital design community, she argues, are the speculative fiction stories and myths that, as we have already seen, exert tremendous causal power upon the digital design CoP. Speculative fiction is fiction that was a fleshed-out world where all participants in that world are bound by the same constraints and rules. The rules can be technological, but they can also be cultural. We saw earlier that the volumetric projection technology used in *Star Wars* is bound by the cultural rules of that world--it respects hierarchy and socially appropriate body language. When taking interface cues from technology in speculative fiction, it stands to reason that some of the political and cultural properties embedded within the design process of those technologies would come along for the ride.

Is contemporary digital design impacted by the myths and values derived from World Three speculative fiction in the same way that Borsook claims 1990s design was? Rand, Heinlein, Gibson, and, to a lesser extent, Dick have certainly receded from the foreground of digital design culture in the past 20 years. Speculative fiction remains a powerful causal force, but it is unclear if the libertarianism that still has a major foothold within the digital design CoP continues to originate from these World Three speculative fictions or if it is more a product of inertia, of a calcified value set in the CoP from the 1990s that is difficult to dislodge.

While it is difficult to prove what exactly speculative fiction's continued impact on the ethics of designers is, I can offer one salient example of its presence in ethical and political debate within the CoP. Visual Effects Solidarity International (VFXSI), the digital artist's rights organization mentioned in the Introduction, sometimes uses speculative fiction characters as examples of those who would advocate for digital worker rights. One of their earliest

²¹⁹ Borsook, (2000), page 93

"advertisements" is a sketch of Superman standing next to a digital designer. Superman is in full uniform, and the designer wears a white t-shirt with a bright green square in the middle, the same type of t-shirt that VFXSI sells for funding that represents what movies would look like without digital artists--just a green screen. Superman motions to the "S" on his chest and says a line from the 2013 film *Man of Steel*: "It's not an 'S.' On my planet, it means 'hope.'" The designer points at the green square on his chest and replies, "Mine does, too."²²⁰



Figure 13: Superman supports the VFXSI

VFXSI is recruiting Superman to advocate for digital artists. Superman is a supporter of the "little guy," he brings hope to the masses in his universe; at the same time, he is an individual who operates outside of the law, he uses his special powers and knowledge to conquer problems facing humanity. He is a New Warrior just like the designer, who also uses his special powers, though technological in origin, to solve problems and help the masses, the users he is designing for.

²²⁰ Taken from the VFXSI Facebook page

In a later comic, VFXSI also recruits William Wallace of *Braveheart* to the cause. Wallace gallops into a digital arts studio, astride his horse and with his greatsword drawn, and beseeches the artists inside to unite and fight against the low wages and foreign tax incentives that are harming Hollywood studios. One of the artists at his computer desk replies back to Wallace: "We can't get these guys to agree on *LUNCH*, and now you want them to do *WHAT?*"²²¹

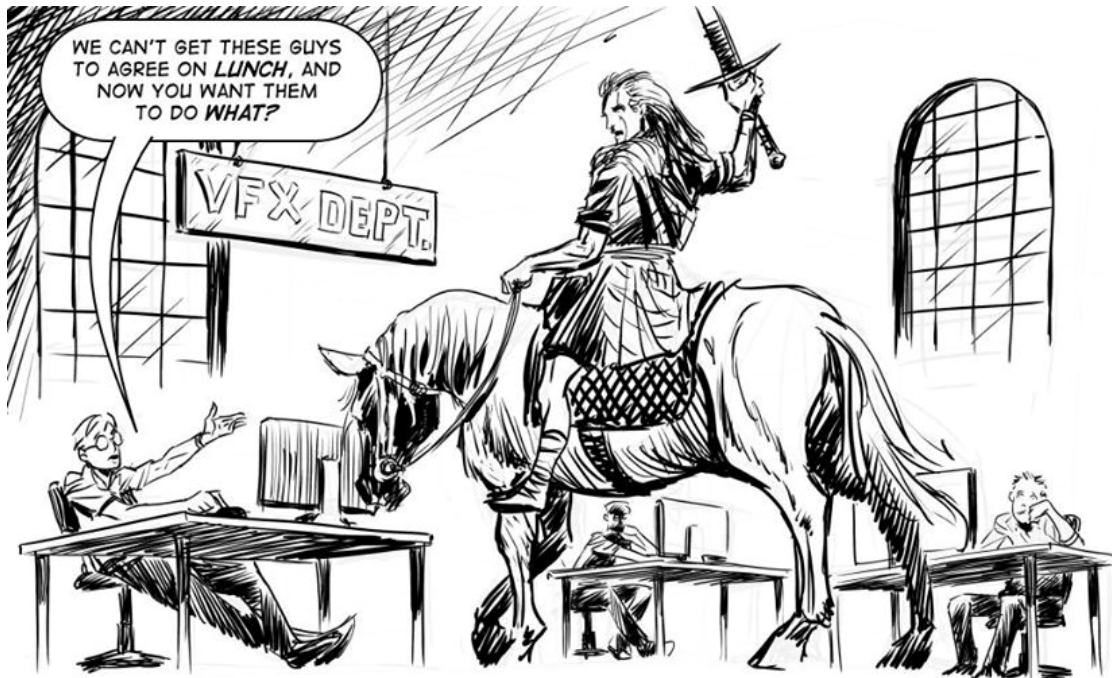


Figure 14: William Wallace tries to rally VFXSI

William Wallace, though not from the science fiction end of speculative fiction, still represents the libertarian spirit that permeates the design CoP. It should be noted that this comic was drawn after several planned protests and demonstrations organized by VFXSI fizzled because of lack of participation.

World Three characters like Superman and William Wallace can participate in the negotiation of meaning in the design community. They represent calls to action--specifically the aggressive, individualistic, New Warrior kind of action that gels with the libertarian value set

²²¹ Taken from the VFXSI Facebook page

that impacts the culture of the design community. They, like Elizabeth from *Bioshock Infinite*, have objective properties, and even objective values and beliefs, that negotiate meaning alongside digital designers. They can have a sort of personhood, a "Du-ness," as well. It is arguable that Commander De Winne, the commander of the International Space Station from the beginning of this chapter, was not all that interested in talking to Sir Patrick Stewart. Rather, he was more interested in gaining a closeness to the World Three character of Captain Jean-Luc Picard. When De Winne dressed as a Starfleet Commander, he was not dressed in Stewart's costume, he was dressed in Picard's uniform.

Conclusion

The goal of this dissertation was to explore the complexities and nuances of the members of the digital design community and the material and cultural forces that shape those members. Digital designers are not just those who work in professional studios or freelance. They are also amateur producers who work on personal computers at home. They are sculptors who design bodies in a three-dimensional digital space that are then instantiated in biological matter. They are bundles of computer programs that are learning to help the player navigate the designed gameworld. They are Sith Lords showing web designers how volumetric displays should work.

To work with digital technology is to work with the properties of digital objects. To think in an object-oriented fashion. Designers, whether or not they work with a computer, can work digitally. They are concerned with what exists in the material and cultural world, what the properties of those existences are, and what impacts those properties have. They are creators, in that they design new ideas and material objects to have causal impacts upon the rest of the network. They are thinking about the world ontologically. They are an ontic community. They are an orthodogmatic, not orthopraxic, Community of Practice. This may seem counter-intuitive. But game designers, animators, riggers, lighters, musicians, authors, computers, and ideas can all work in vastly different ways, with vastly different tools, and still consider each other to be practicing the same domain. Their domain of practice is defined by their shared understanding of what is digital art, even when the individual practices may be miles apart.

The invocation of ontology, particularly object-oriented ontology, combined with a Popperian ontology, allows social scientists to more fully understand all aspects of the design experience. It allows analysts to avoid the post-structuralist trap outlined by Levi Bryant, which

cuts off study and contemplation of the non-human or the non-performative from processes and networks. As Ian Bogost argues for object-oriented ontology:

Moves like these allow us to steer between the Scylla of cultural relativism, a common critique of media studies and social scientific analyses of subjects like computing, and the Charybdis of scientific reductionism, a common problem found in formal and material analyses of those subjects... [Object-oriented] ontology allows [objects and processes] to be both and neither. We can distinguish the ontological status of computer program-as-code from game-as-play session without making an appeal to an ideal notion of game as form, type, or transcendental. The power of flat ontology comes from its indiscretion. It refuses distinction and welcomes all into the temple of being.²²²

Digital design is an act of creation, one that creates and negotiates meaning and “best practices,” at times even independently of the material work of creation. Designers conceive ideas and in doing so create them as targets for both testing and iteration as well as goals and instruction manuals for future design. These ideas and the material objects they spawn and spawn from engage in a dialectic with the “selves” who produce digital art.

Digital design, then, must be defined in a similarly indiscrete manner as Bogost describes. Digital design is a playful practice, one where meaning, production, and those who produce are scattered across the social, material, and cultural realms of the world.

²²² Bogost, I. (2012) *Alien Phenomenology or What It's Like to Be a Thing*. University of Minnesota Press, page 19

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Curriculum Vitae

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Ph.D. in Culture, Communication, and Media

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Publications:

Malazita, J., Nikolaev, A., Porpora, D. (2014) "Moral Argument in the Public Sphere: The Case of Bosnia," *Review of Communication*

Rocheleau, S., Muschio, G., **Malazita, J.**, Petrovich, M., Mohan, J., (2013) "STAR Scholars and Digital Cultural Heritage," *CUR Quarterly*, Winter 2013

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