

Seeing Non-humans: A Social Ontology of the Visual Technology Photoshop

Dissertation

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Abstract

In an expanding technological ecology, the spaces of learning in art education require a new appraisal of the role that visual technologies serve to learners. Through intersections of actor-network theory and theories of visibility from visual culture studies, this research focuses on developing a social ontology to investigate the role that the visual technology Photoshop plays in collaborating with users within a human-technological hybrid. In a role reversal, for this research I become the instrument of research and Photoshop becomes the focus of a non-human ethnographic inquiry that utilizes an ontological framework to consider how technology performs with us and not on us. This symmetry between human and non-humans in a social ontology generates the complexity of Photoshop in a heterogeneous network formation of agencies, through more than its instrumentality, by *seeing it working with me* in the production of digital visual culture.

Dedication

Dedicated to my family.

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Chapter 1: Introduction

My Story of Teaching Art in a Computer Lab

“No!?”

“ What you are doing just doesn’t fit in AP Art.”

The surprise on Moe’s face, responding to my rejection of his work for Advanced Placement (AP) Art¹, spoke volumes to the deep conflict I felt within myself in having to tell him his work just didn’t fit. The rich interactive design on the computer screen in front of me was a powerful reminder of the learning experiences my students were engaging through website design that had little recognition for scholastic opportunities in the art classroom. Moe, my student at Seoul International School (SIS) in South Korea in 2003, was sharing with me a web interface he had developed outside of class. In addition to the advanced computer program coding that the project showcased, the project was an early

¹ Advanced Placement is a program that allows secondary students to take college-level courses for possible credit while still in high school.

endeavor in creating social media.² The interface was designed so that his friends could upload songs into a common database, and then use the music player to stream the music to their various computers in different constructed playlists. In our conversations, it became clear to me that the coded software was one aspect of his ambitious project; Moe was trying to create an online space to share with his friends his growing interest in hip hop and DJ music assemblage in an interactive exchange. From this intersection of interests, Moe and I worked on the visual components for his website utilizing graphic design software to construct the interface and to visually position the player within his interests in hip hop culture. His hybrid practice, mixing modalities of music, graphics, and social interaction had no space for expression or validity inside the art classroom, and as the hallmark of achievement for any art student in our school, Moe's work had no place in the portfolio process of AP Art.

As our collaboration continued over the years, usually through lunch periods and work study credits, I had the pleasure of mentoring Moe in his high school years through numerous projects dealing with the school website and designing interactive multimedia presentations that our headmaster used to recruit teachers to our school. In our work together we crafted graphical user interfaces (GUI) using hypertext mark-up language (HTML) and cascading style sheets (CSS), increased user interactivity by integrating computer programming languages such as JavaScript, and developed raster and vector graphics using Adobe Photoshop and Adobe Illustrator. Through many of these experiences I

² The term "social media" will be used throughout this proposal to characterize interactions between people online. Media should be understood as digital in format and inclusive of written text, audio tracks, and still and moving images.

was continually frustrated by the compelling work that Moe was doing and my own lack of opportunities for his work. I was distraught to have to reject Moe's application for our AP Art course in Drawing and 2-D Design based on his lack of experience in drawing. His complex computer interfaces and visually rich graphics work did not have a place in a design portfolio that focused on the Elements and Principles of Design, especially when the format for submission in slides and prints would in no way showcase the sophisticated interactivity and motion graphics that he developed in these websites and programs.

In addition to the portfolio limitations there was also the refusal of the AP to consider collaborative submissions. Moe and I were often members in a larger collaboration and working within a team dynamic to finish large-scale projects. The exclusion of collaborative projects by AP Art portfolio guidelines denied recognition of my computer students' projects that required a massive coordination of design and coding that showcased an amazing ability by them to work together. For high school students enrolled in my computer and design classes, AP made it clear there was no place for this type of work in the art portfolio, and the limitations of the AP computer science curriculum equally foreclosed opportunity for these students' work. We did work hard to find web design contests, most significantly Oracle's *Thinkquest* international competition for students in K-12, but inside of the art education field there appeared to be little opportunity for Moe and students like him to build a strong resume for their college applications.

Throughout my four years working as a teacher at SIS my own trajectory reflected some of the disconnect I felt was occurring between student's practices in digital multimedia and art education. Initially hired as a computer teacher in 2003, focusing on business software applications, website programming, and computer programming languages, I received support from my administration to redesign our technology curriculum to better meet student needs. Enrollment had been dropping in courses that focused solely on computer programming, and my high school principal was looking for a technology curriculum that would continue to meet the interest and educational needs of students. Through the development of introductory and advanced courses in web design and graphic design, a combination of both computer skills and digital visual production using graphic design software, we redirected our curriculum to combine the possibilities of multimedia and graphics in website publishing that would continue to teach computer programming fundamentals. However, as electives these courses were either taken for personal interest or technological skill building. By the time students reached their junior year, pressured by college applications and the need to keep their resumes competitive by adding AP courses, their accomplishments in these electives were left outside of the college preparatory curriculum. Certainly their experiences in graphic design, computer programming, and multimedia were valuable learning opportunities that would serve them well in performing in increasingly technology-driven workplaces and universities, but there was a gap in how these hybrid practices with technology could be utilized as academic achievements inside our school.

In 2007, my final year at SIS, I recall the frustration of working with my

administrators in finding a replacement for me. At that point I was teaching the AP Drawing and 2-D Design portfolio class and courses in our web design and graphic design curriculum. There was anxiety among my administrators that the overlapping of these areas in my own workload would be improbable to duplicate for the incoming hire: art teachers were not computer teachers. Through their assumptions of art teaching practices, the creativity and craft of making 2-D and 3-D work had little to no connection to computer classes filled with programming logic and mathematics, business software skill-building, and learning online research skills. However, I was seeing a very different future for using these technologies in schools that was informed partially through my work with students like Moe.

In my experience with my students, creating the visual components of digital multimedia was becoming increasingly central to the work happening in my computer lab, and this type of work beckoned strongly to a teacher immersed in an art education pedagogy focused on visuality. This type of pedagogy pursues an art and design curriculum that downplays technology as an end in and of itself: technologies, such as graphic design software and website coding, were used as tools to investigate the nature of visuality. Visuality, used here, is the mediation of discourses that are inserted “between the subject and the world” (Bryson, 1988, p. 91) and focuses on the social construction of the visual (Duncum, 2001; Foster, 1988; Tavin, 2003). Inside of an art classroom that investigates visuality, inquiry “involve[s] discourses on all the visual arts, such as

media studies, design education, cultural critique, and visual anthropology” (Freedman & Stuhr, 2004, p. 826). I felt I had experienced an opportunity to use the art classroom to engage students in exciting new projects using digital media that explored the performance of the interface, and introduce ways of utilizing video and graphics to make complex statements from an inquiry of visuality. At that time, new digital software capabilities and Web 2.0³ platforms were gaining momentum in transforming participation online, and social media websites, such as MySpace and Xanga, were becoming an ever more present part of my students’ social lives. I found myself in the midst of a changing landscape of visual production, where I perceived an explosion of new technological tools, but I had to also acknowledge the gap that existed for their use in school-based learning.

As an art teacher I felt my curriculum could fill that gap, because visuality plays a powerful role in digital technology. For example, I recall discussing with Moe, in my last year at SIS, the types of social media he and his friends were using, and he described to me a migration from websites such as MySpace to the somewhat newer Facebook because it “looked cleaner.” These quickly evolving technological opportunities suggested to me that there was an imperative for K-12 art educators to take up these challenges to better understand how pedagogies in the art classroom might use these innovations for learning in a visual culture, and conversely how visual culture studies could provide theories to better understand the visuality of these innovations.

What convinced me the most that art educators needed to grapple more

³ The term “Web 2.0” will be used in this study to indicate a shift in Internet websites from content providers to platforms for user-produced content (Sharma, 2008, O’Reilly, 2005).

completely with the challenges of technological innovations and learning was the overwhelming enthusiasm that came from my students involved in these courses and the positive ways that our art department appeared to be charting a relevant course for their future. Their enthusiasm and dedication to our technology curriculum indicated to me that we were onto something even if our courses did not come with the academic accolades that accompanied AP courses. Students involved in this curriculum displayed a voracious appetite for mastering graphic design software and displaying virtuosity with their ability to develop programming code.

At the time, I equated this mastery with the deft handling of drawing implements by a skilled art student: if graphic design software was a tool, much like a drawing pencil, then teaching students to use software was similar to teaching them to use a pencil. My job was to facilitate mastery of the tool so that students could then use it to make visual expressions of their world. However, in hindsight this comparison does not adequately frame the relationship of the network of intermediaries that enter into the process of using technology such as graphic design software. It is not a question of complexity, as material culture scholars have demonstrated complexity in the most basic of everyday objects (Berger, 2009; Norman, 2011), and even the pencil can be seen to have a complicated history and engineering legacy (Petroski, 1989). However, the software and operating systems that were loaded on the computers that we used in the art classroom and computer lab had other characteristics that seemed to

evolve from their connection to larger technological networks. Pencils never connect to their manufacturing company to check for updates. Pencils do not require licenses and do not have rules about how many people can use them. A drawing completed with one pencil does not need to be re-formatted to use another pencil, and pencils can be used on any kind of paper. New versions of the pencil are not marketed every eighteen months along with the publications and instructional manuals that continually need to keep pace with these rapid developments. Online communities of learning and technique development are far more complex and extensive with software than with people trying to learn how to use a pencil for drawing. All of these differences related to complex market relationships, distribution models, network connectivity, and the culture of proprietary software development, but many of these differences factored into how students, the school, and myself could use these “tools.” And beyond these considerations of the instrumentality of software to the school, there were cultural shifts in the ways in which people thought about certain types of software. For example, we used Adobe Photoshop (here forward to be referenced only as Photoshop) in almost all of my classes, and during my time at SIS there was a more and more common reference in popular discourse to the name of the software being used as a verb, as in someone got “photoshopped.”

All of these characteristics of software, and the years of teaching it to students thinking of it as a tool, lead me to question how we may think about what graphic design software, such as Photoshop, is when we use it in the art classroom with students. How does my capacity to recognize graphic design software as more-than-a-tool change my understanding of student learning with

technology? These questions call for a shifting conception of innovations in visual technologies as a manifestation of an increased human-technology interrelation. This shifting conception requires a deeper understanding of the contributions that these technologies make to the world as non-human actors, especially as these technologies become more ubiquitous.

To help facilitate this deeper understanding I will draw from actor-network theory⁴ (ANT) (Callon, 1986; Latour, 2005; Law & Hassard, 1999). As prominent ANT theorist and philosopher, Bruno Latour (2004) states:

As soon as we stop taking non-humans as objects, as soon as we allow them to enter the collective in the form of new entities with uncertain boundaries, entities that hesitate, quake, and induce perplexity, it is not hard to see that we can grant them the designation of actors. (p. 76)

For ANT sociologists, understanding the contributions of non-human actors, what they call actants⁵, invigorates sociological investigation to gather its full list of contributing actors. These actants and their associations with one another are framed as network formations. In this way, ANT provides an important fluidity to understanding social interactions that include non-human contributions. These non-human contributions begin to transform understandings of how visibility can be re-constructed through not only the visual and discourse, but also through the

⁴ There is much speculation, and resistance, on which phrase to use (Latour, 2005; Law & Hassard, 1999), but for consistency I will use the term actor-network theory and its acronym ANT throughout this study. This selection upholds the “*intentionally oxymoronic*, a tension which lies between the centred ‘actor’ on the one hand and the decentred ‘network’ on the other” (Law, 1999, p. 5).

⁵ An actant, a term borrowed from narrative theory, is an open-ended figuration of what may hold agency in the schema of actor-networks (Latour, 2005). Actants, as both humans and non-humans, enter into associations with one another that constitute the networks which are the focus of ANT (Brown & Capdevila, 1999).

innovations in visual technologies that can be accounted for in collecting the various actors that gather in the art/computer classroom. For the purposes of this study, I will focus on developing the intersections of ANT sociological theories and theories of visibility from visual culture studies to then provide a deeper understanding of Photoshop as a human-technological collaboration that moves beyond its instrumentality. I will use this notion of collaboration to signal a movement beyond user/instrument frameworks in order to look to the possibilities of what a network of humans and non-humans mutually construct through relational interactions where both parties are invoked to act and contribute. Collaboration is more than an interaction, because it invokes balance, or reflects on imbalance, in the contributions from participating members. Looking at human-technological collaboration is the first step in recognizing actant symmetry and the relational making of “digital visual culture” (Sweeny, 2004, p. 75).

Conceptualizing the Technological Ecology and Digital Chimera

Part of the reason that there needs to be such a radical shift in understanding innovative technologies in learning and schooling is the rapid expansion of the technological ecology⁶ offered to students inside and outside of schools. Desktop computers, laptops, and smart phones have become fixtures in many classrooms. The interactivity of language through hypertext is taken for granted as a building block to the many websites that Internet users visit today,

⁶ I am using technological ecologies as “environments—which include both human and technological actors— [that] are akin ... to ecological systems and deserve to be studied in all their layered, interconnected complexity”(DeVoss, McKee, & Selfe, 2009).

and has been massively augmented by the widespread availability of broadband data connections and multimedia content. The wide-open virtual spaces of the World Wide Web, once so filled with utopian hopes of a global village (Rheingold, 1993; McLuhan, 1964), a virtual public sphere large enough to house the voices of the world, are heavily populated with media corporations, data servers, and websites. The promise of a democratic online space is in reality a complicated scale-free⁷ network of multimedia crowded with competing agendas of consumption, entertainment, social networking, and political action that continues to offer opportunity and exclusion. Increased participation is coupled with the digital divide, a term that refers to the divergence in those who use the Internet and those who do not, illustrating that “disparities in technology access and use are related to socioeconomic status, with income, educational level and race among the factors associated with technological attainment” (Mehra, Merkel, & Bishop, 2004, p. 782). Increased user-generated content has challenged corporate media producers and opened up debates on the freedoms of creativity versus the protections of copyright. (Jenkins, 2006; Lessig, 2004). The utopian promises of Vannever Bush’s (1945) visionary memex, often posited as the inspiration to Ted Nelson’s invention of hypertext in 1965 (Wolf, 1995), are nothing more than a chimera: a mythical and illusory beast, forever in the framing metaphors that are used to understand cultural technologies and out of the reach

⁷ Albert-László Barabási (2003) states “scale-free topology is a natural consequence of the ever-expanding nature of real networks. Starting from two connecting nodes...a new node is added to the network. When deciding where to link, new nodes prefer to attach to more connected nodes. Thanks to growth and preferential attachment, a few highly connected hubs emerge.” (p. 87)

of real world applications.

Using the mythical chimera as metaphor to understand the developments of digital technologies lacks the complexity of the ways that technologies mutate and persist in varied relationships with older technologies, institutions, and their human users in the world. Instead, the genetic aberration known by the same name—chimera—offers a more useful metaphor for digital multimedia of network technologies. A genetic chimera is when an organism has two or more genetically distinct cells that originated in different zygotes, and is a result of developing fraternal twin embryos fusing together to become one embryo (Vladar, 2004). As a metaphor for conceptualizing the current state of digital media, the digital chimera is representative of new digital texts containing moving images, sound, and alphanumeric language constructions, but which are also composed with the inheritances of the technologies of the twentieth century. New media⁸ arises with the same entanglements as old media technologies (television, newspapers, radio shows), but with a new speed and modality that changes its formal properties and its context for analysis (Bartram, 2004; Virilio, 2001). As Lev Manovich (2001) states:

new media represents a convergence of two separate historical trajectories: computing and media technologies... In a parallel moment, we witness the rise of modern media technologies that allow the storage of images, image sequences, sounds, and text using different material forms—photographic plates, film stocks, gramophone records, etc. The synthesis of these two histories? The translation of all existing media into numerical data accessible through computers. The result is new media—graphics, moving images, sounds, shapes, spaces, and texts that have become computable (p. 20)

⁸ The term “new media” has a broad range of applications that can include technologies, multimedia texts, and/or performances that are digital in nature. I will use it sparingly within the context of media studies scholarship, but move on to more particular language for the digital technologies under investigation. See Manovich, 2003 for a thorough definition.

This digital chimera further mutates older models of technology when we consider the complexity of the global deployment of new media forms. Governed by data servers and the logic of packet switching, a massive decentralized network of computers connect through fiber optics spanning the floors of the world's oceans, literally encompassing the globe, and wireless spheres of information spread binary code in every direction. This global connectivity has shifted national identity outside of geographic borders (Barwell & Bowles, 2000) and fostered greater deterritorialization of media cultures advanced by transnational capitalist markets (Hepp, 2008).

The mutations of new media forms and network technologies has created a media landscape that resembles the broadcast technologies of the twentieth century, but that ultimately requires a reconceptualization of its possible meanings and implications for contemporary society and education. The many digital chimera of global networks are the component parts of an expanding technological ecology that Moe and my other students were learning to navigate, and most of that exploration and learning was happening outside of school.

Students and Schools in the Technological Ecology

My students in Korea may be seen as a microcosm of the ways that schooling is changing in relationship to technological ecologies. Over the past decade, higher education institutions have developed online educational

experiences through distance learning, e-learning and web-based instruction. There are entire universities that exist online, such as the University of Phoenix, and with the availability of so many new technologies many higher education institutions cater to a “blended learning” where pedagogical opportunities take place inside of a classroom that combines physical space with the virtual spaces of the Internet (Bonk, 2010; Shamir-Inbal, Dayan, & Kali, 2009). Debates over the role of teachers in web-based learning (Diaz & Entonado, 2009; Greener, 2009), the anxiety over the disappearance of schools for virtual classrooms (Toch, 2010), and the efficacy of e-learning (Brown, 2010; Journell, 2010; Njenga & Fourie, 2010; Winter, Cotton, Gavin, & Yorke, 2010) proliferate to challenge the blending of virtual spaces for learning and classrooms.

Despite these concerns, there is a diverse range of digital technologies being explored for learning. User-produced content on the Internet, propelled by Web 2.0 technologies, are being used as compelling educational opportunities through platforms such as blogs (Ellison & Wu, 2008; Flatley, 2005) and wikis (Hemmi, Bayne, & Land, 2009; Larusson & Alterman, 2009) to support collaborative learning (Lending, 2010; Pozzi, 2010). Virtual worlds are being explored as learning environments in online education (Petraou, 2010). Mobile devices, which contribute to “anytime and anywhere” opportunities for learning, are being explored for their ability to circumvent costly infrastructures of hard-wired network computer labs (Frohberg, Göth, & Schwabe, 2009; Otair, Al-Jedaiah, Al-Zoubi, & Al-Refaee, 2010). Video games have garnered widespread interest for the potential benefits that they provide to “engaged learning” (Suja’ee & Khine, 2009; Sweeny, 2010b), increased motivation in learning tasks (Jackson,

2009), and expanded notions of literacy (Beavis & O'Mara, 2010; Gee, 2003). Social networking websites are being theorized for their potential contributions to learning communities (Itó, M. et al., 2010; Muijs, West, & Ainscow, 2010; Watkins, 2009). These shifts are not only placing strain on schools to change and make new allowances for student populations, but these changes suggest that curriculum and teachers be prepared to meet the new challenges and needs for a school in a technological ecology.

This technological ecology has evolved so quickly that it is often younger generations privileged with access that are better equipped to deal with these new challenges. A variety of terms has been used to describe this generational connection to network technologies; examples include “net generation” (Junco & Mastrodicasa, 2007; Tapscott, 1998), the Kaiser Family Foundation's report on “Generation M” (“M” stands for media) (Roberts, Foehr, & Rideout, 2005), “gamer generation” (Beck & Wade, 2004), “millennials” (Geraci & Nagy, 2004; Howe & Strauss, 2000), and “digital natives” (Palfrey & Grasser, 2008; Prensky, 2001, 2006). While there are many without access to these technologies and their opportunities, those with access are a generation of learners developing within a rapid expansion of networked technologies of the online virtual world that is blending classrooms with anytime and anywhere spaces of learning.

These so-called “digital natives” inhabit a world through the technological ecology that is different from the one comprised of broadcast technologies of the 20th century. However, as media education proponent David Buckingham (2006)

states, “from this perspective, technology is seen to emerge from a neutral process of scientific research and development, rather than from the interplay of complex social, economic, and political changes—irrespective of the ways in which it is used, and of the social contexts and processes into which it enters” (p.9). This form of technological determinism “runs the risk of attributing an all-powerful role to technology” (Buckingham, 2006, p.11). This mixture of the digitality of a younger generation combined with a responsibility for media educators to forefront a complex interplay of forces may require that the innovations of technological actants, as digital chimera that populate an expanding technological ecology, be a primary participant in educational research. ANT methodology presents a unique opportunity to focus on technological actants in symmetrical relationships with human actors in gathering the many contributing factors within these new learning spaces. This symmetrical focus requires that the innovations of technologies be analyzed not only for the ways that human counterparts use them, but also to look inside the technologies themselves as they are deployed in the world.

Seeing a Network Being

Looking inside of technologies is a lot like looking at their DNA, and returns to the metaphor of the digital chimera that allows for the inheritance of media mutation from broadcast to network existence. From this perspective, the expanding difference between the habits and performances of the technologies themselves within these cultural and social spaces becomes paramount in

understanding their contributions to how we exist in the world, and how students are using them to understand their worlds. Along with this media mutation inheritance comes the complexity of recognizing innovative technologies as being more than a tool. As media theorist Douglas Rushkoff (2010) states,

Computers and networks are more than mere tools: They are like living things, themselves. Unlike a rake, a pen, or even a jackhammer, a digital technology is programmed. This means it comes with instructions not just for its use, but also for itself. And as such technologies begin to characterize the future of the way we live and work, the people programming them take on an increasingly important role in shaping our world and how it works. After that, it's the digital technologies themselves that will be shaping our world, both with and without our explicit cooperation. (p. 8)

Rushkoff's emphasis on the computer as more-than-a-tool is an important shift in understanding how users interact with technologies. Although Rushkoff's focus is more on the importance of understanding the underlying computer code of these technologies, my focus is more explicitly in how this shift changes understandings of working with visual technologies in a digital visual culture. Essentially, innovation in visual technologies, as it is deployed in the world through networked connectivity, changes the way of being in the world. As shorthand for this difference I will use the phrase "network being" to describe being in the networked spaces of innovation, both online and offline, of the technological ecology that digital natives inhabit.

The concept of the network is an important one for this research, and it has been used in other branches of the social sciences, like ANT, as not necessarily a technological reference. Networks reference social formations that have been

used to describe families, organizations, economic markets, and globalization (Scott, 2002). Manuel Castells' (1996) *The Rise of Network Society* offers an overlap of the technological networks with that of social formation. For Castells, the privileging of network organization in late capitalism has collapsed spatial barriers as information flows through the networks of the Internet at the speed of light. The network society "constitute[s] the new social morphology" (Castells, 1996, p. 469) that shapes, through access to and strategic play in the networked flow of information, the ability to generate new knowledge, amass political power, mobilize constituencies in collective action, and render an endless (re)construction of the self (Castells, 1999, pp. 60-63). The concept of the network society has drawn much attention in the social sciences, and led to a generative discourse of connections and flows that map the rise of a "network sociality" (Wittel, 2008).

As generative as the concept of the network society has been for sociology, this study suggests a slight shift to investigate a network being. The coupling of the terms "network" and "being" is an intentional shift to an ontological framework to understand sociality through its constitution in the world, as it exists not as it is socially constructed, within a network formation. Ontology, as a branch of metaphysics, is the study of being and existence. As Annemarie Mol (1999) states, ontology is "standard philosophical parlance [that] defines what belongs to the real, the conditions of possibility we live with" (p. 74-75). Ontology "yields answers to the questions of what there is" (Faye, Scheffler, & Urchs, 2000, p. 4), and this premeditation on "real" and "is" leads ontological investigation into the world of things or objects. This premeditation on ontologies, things in the world, is

a central preoccupation to an ANT focus on the symmetry of technological and human actants in social formations.

Critical anthropologist Arturo Escobar (2007) describes this framework as the “ontological turn” in social theory that starts with “the realist stance of asserting the autonomy of social entities from the conceptions we have of them” in order to “convey a sense of the irreducible social complexity of the world” (p. 107). A focus on the symmetry of humans and non-humans within social formations, or a social ontology (DeLanda, 2002; Escobar, 2007), is seemingly at odds with a social construction, which is a central conceptual framework for studies of visibility. This tension derives from the constructivist application of social theory to social formations in an *a priori* fashion, instead of, as prominent ANT scholar Bruno Latour (2005) would advise, “following the actant” to gather the complex and varied agencies that are a part of its make up. The phrase network being within my research focuses on networks, as simultaneously sociological metaphors and technological structures, and being, as a focus on being in the world as an ontological mapping.

Network being is not determined by technology, but instead suggests an existence in rhizomatic virtual worlds that are realized through technological and non-technological networks. It is an exploration of the ways that being in the world has changed with innovative technologies through their successes and failures, and looks closely at collaboration with them. A network being is also an investigation of non-technological being that is remediated through the catalytic

interactions of network technologies and their human users. This revisioning of non-technological being within a network being is an extension of the posthumanist project of expanding notions of subjectivity within postmodernity by utilizing the machine and animal hybrids of the cyborg imaginary (Haraway, 1991; 1997; Hayles, 1999). This tactic of cyborg feminists, such as Donna Haraway and N. Katherine Hayles, is appropriated within understandings of a network being to facilitate how the insights of theory building surrounding network technologies may allow a re-thinking of non-technological being as networks or as existing within network structures.

The need for theory-building of network being is made urgent by a framework where contemporary students are perceived as digital natives, and the resulting implications of what might be the guiding principles to a pedagogy that would address these connected spaces as being in the world. Contemplating the pedagogical imperatives for digital natives in a network being might take into account what types of participation is taking place online for those young people that do have access to networked computing.

According to The Pew Internet & American Life Project's publication *Generations Online in 2009* (Jones & Fox, 2009) teens and Generation Y, age 12-32, dominated online activity. The study also indicates that online activity is rising in all age groups, but it is the ways that Generation Y is employing Internet technologies that sets them apart from other age groups. They are the most likely to use the Internet for entertainment through videos, online games, virtual worlds, and music downloads. They are also more likely to communicate with family and friends through publishing personal blogs, maintaining profiles on social

networking sites, and utilizing instant messaging applications (Jones & Fox, 2009, p.6). The online activities of digital natives tell us of a mediascape of social interaction: complicated network spaces that utilize Web 2.0 capabilities to communicate and publish online identities to communities of people that are from online and offline associations (Watkins, 2009). In addition to the types of online activity that are occurring in the lives of young people, the spaces of online access are expanding as smart phones become more pervasive (Lenhart, 2010). The confluence of these software and hardware digital technologies is changing “our values and norms surrounding education, literacy, and public participation... challenged by a shifting landscape of media and communications where youth are central actors” (Itó et al., 2010, pp.1-2). These shifts in youth online participation suggest that they are indeed in a technological ecology as digital natives, and that the challenge for educators is to develop pedagogies that engage student’s hybrid digital practices within network spaces and create opportunities for learning.

These learning opportunities will be happening in a network where modes of communication are heavily visual in form. Educators should consider the complex and fast-paced changes of learning spaces that such a technological ecology provide in order to take advantage of its affordances. However, if these opportunities are ignored it may contribute to another iteration of the digital divide: denied “access to this participatory culture⁹ functions as a new form of the

⁹ Jenkins et al. (2006) state “A participatory culture is a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one’s creations, and some type of informal mentorship whereby what is known by the most experienced is passed along to novices” (p. 3).

hidden curriculum, shaping which youth will succeed and which will be left behind as they enter school and the work place” (Jenkins, Clinton, Purushotma, Robison, & Weigel, 2006, p. 3). From an art educator’s perspective, investigating visuality within the technological ecology may offer a wider field of interdisciplinary understandings to the hybrid forms of learning in a participatory culture.

Art educators harness a unique position to bring a visual culture pedagogy, where visuality is central to learning inquiry, to instruct future generations of learners in network spaces through investigations of the visual apparatus of network technologies and through a deeper understanding of our use of innovative technologies in constructing visual culture. Art classrooms are technological ecologies populated with digital cameras and drawing tablets connected to computers that run various pieces of graphic design software. However, visual culture and the study of the visuality of networks may be a part of this hidden curriculum. As Robert Sweeny (2010b) states in his discussion of video games and learning scholarship, “many studies tend to downplay the visual and spatial aspects” (p. 264). What attention needs to be given to the visual apparatus of the network and visual technologies such as Photoshop for their role in collaboration with humans within educational spaces?

For this research, I intend to explore the ways in which innovative technologies add layers of meaning to explorations of visuality by shifting focus away from conceptions of technological tools to instead developing a more robust understanding of our human-technological collaborations. To clarify, it is not my position to over-determine software capabilities as instruments of expression, nor

is it my goal to suggest that somehow the technology determines the output of expression or meaning making that is derived when it is employed in the creative process. These positions of determinism have always found their place in discussions of technology (Buckingham, 2006). Rather it is the objective of this research to use intersections of ANT theory and visibility to provide deeper understandings of our human-technological collaborations within the technological ecology so that we may better understand our learning and participation within it.

Perceptions of Technology in Art Education

Utilizing an ontological framework, via ANT, is important to the field of art education for the ways that it might contribute to a pedagogy that is better equipped to utilize students' hybrid digital practices for learning. Contemplating the impact of technologies on learning through the arts, and thinking about how utilizing innovative technology to make art as a way to explore not only new art but also to explore potentialities of technology to human experience is not a new phenomenon. David Ecker (1962), in his discussion of automated teaching machines and art education, perceived his own contemporary moment in the 1960's as "a society so thoroughly technological" (p. 8). There is a long history of art educators exploring the intersections of technology and art making, and by quickly surveying this scholarship over the last two decades, it is evident that many different innovative visual technologies have been explored for their impact

on art education: the introduction of laserdiscs (Anderson, 1985; Schwartz, 1991), creating graphics on computers (Madeja, 1993; Stokrocki, 1986) and using hypermedia (Keifer-Boyd, 1996, 1997; Taylor & Carpenter, 2002).

The autumn volume of *Studies in Art Education* (2004), a themed “Technology Issue,” provides a good barometer for how this research contrasts with scholarship in the field of art education and its response to a technological ecology. In the issue there is a focus on technologies and visual literacy (Stankiewicz, 2004), thinking critically about Internet art (Colman, 2004), considering the difficult contexts of adopting newer technologies in K-12 education (Delacruz, 2004), using performance art and critical theory to highlight the ways technology mediate our lived experiences (Garoian & Gaudelius, 2004a), examining multicultural arts courses delivered in online formats (Lai & Ball, 2004), and analyzing the ways that visuality can shift in the context of a networked digital technology (Sweeny, 2004).

In some of these examples, technology is broadly constructed as a tool or medium to be used, manipulated, and interpreted in the classroom by students. Colman (2004) uses Internet art to engage secondary students in thinking “critically about their perceptions and use of the Internet, guide them in analyzing works of Internet art, and introduce them to using the Internet as an artistic medium” (p. 61). Lai and Ball (2004), in their discussion of online learning environments and intercultural communication, warn educators about the incorporation of technology into education because “incorporating of Internet technologies is not a matter of simply adding tools on top, as it were, to a given educational context and intercultural dynamic, but a matter of reconstituting the

educational context and the intercultural communicative dynamics themselves” (p. 30). In order to be sensitive to this reconstitution, the authors advocate an ethnographic approach to observe and analyze the “cultural contexts of students and teachers [as they] come into play in online courses” (p. 30). Despite the sensitivity to the particular technology's benefits and drawbacks, in both case they are still positioned as tools within the learning space.

The notion of technology and its impacts beyond instrumentality, as a dynamic within the constitution of cultural spaces and contexts, is a powerful theme in some of the articles. Charles Garoian and Yvonne Gaudelius (2004a) explore the pedagogical spaces of performance art to “begin conversations about the ways in which culture and cultural identities are shaped by the meanings that we give to art and technology” (p. 49). In their formation they are exploring a dialectic of pedagogy and technology to extend our understanding of technology outside of its instrumentality, its machinic construction and rationalist hierarchies, so that technologies may function “not only as a set of practices but also as a pedagogical metaphor” that can operate in tension with instrumentality (Garoian & Gaudelius, 2004a, p. 50). For Garoian and Gaudelius, performance art is perceived as an embodied technology of critique to resist the “command of information technologies and the marketplace determinations” (p. 59).

Elizabeth Delacruz (2004) takes this critical stance to classroom spaces, and applies the “practicality ethic” to art teacher’s adoption of computer technologies: “A practicality ethic, simply put, is a teacher’s criterion for

determining whether or not a reform initiative is (a) worth the time and attempts, and (b) feasible within the particulars of the teaching situation” (p. 8). By acknowledging the “mythologizing language that accompanies technology advocacy,” Delacruz suggests that the challenge for integrating technology into classroom learning “is to convincingly demonstrate how to engage new technologies in authentic ways that accommodate teachers' values, work conditions, time constraints, and school cultures” (p. 17). This critical distance focuses on the physical spaces of schools and the demands put on them and their participants, particularly teachers, to better contextualize the adoption of new and innovation computer technologies.

Mary Ann Stankiewicz (2004) takes a slightly different tactic, less grounded in the physical classrooms of teachers and schools, and more invested in the historical application of the term “technology” as it is evidenced through American classrooms then and now. Technology is defined as everything from industrial tools to administrative organization in schooling, but the article ends with a similar call to the present in digital technologies: “We need to better understand the complex relationships of technologies to cultural values and broaden the texts, the types of images and objects, that students learn to interpret” (p. 91).

Robert Sweeny (2004), in a sense, takes up this challenge by suggesting the ways that networked computing and its modes of simulation have changed the “practices that operate within the complex interconnections of the ‘network society’ (p. 75). In this way he articulates the “complex relationships of technologies to cultural values” (Stankiewicz, 2004, p.91) through an

understanding of the attributes of contemporary networked computer systems, namely the Internet, that contribute to an understanding of their pedagogical interactions and use in artistic practices. This analysis culminates into what Sweeny calls “‘lines of sight’ that intersect to form the matrix of a digital visual culture” (p. 75). In this sense, technology, particularly network technologies, is a structure with unique attributes of simulation that contribute to the visuality of digital culture, and ultimately to the pedagogy of art education.

According to this review of the autumn volume of *Studies in Art Education* (2004), technology is a medium (Colman, 2004), a context (Lai & Ball, 2004), a metaphor for a language of critique (Garoian & Gaudelius, 2004a), a resource to be engaged (Delacruz, 2004), and a visual apparatus (Sweeny, 2004). Through this survey, the authors’ collective perceptions of technology are a matrix within a digital visual culture that positions it as a thing in relation to its cultural and sociological formations. Contemporarily, this thing of technology is often characterized through network computing, and it is precisely the network structure of this technology that is brought to bear on so many issues of pedagogy in the arts and across interdisciplinary curriculum.

The focus on technologies and art education continues today as Robert Sweeny's (2010a) recent edited collection *Inter/Actions/Inter/Sections: Art Education in a Digital Visual Culture* puts a spotlight on the “utopian possibility coupled with dystopian potential” of opportunities for learning within the expanding technological ecology (p xiii). Within this publication is a range of art

education scholarship that focuses on different technologies in “describing networked forms of creativity, collaborative models of production and distribution, and educational approaches that are digital, dynamic, and distributed” (Sweeny, 2010a, p. ix). The range of technologies that are written about in this edited collection presents a broad scope of technologies: including 3-D modeling and animation software (Gill, 2010), podcasts (Fulmer & Shurter, 2010), digital video (McClure, 2010), Adobe Flash (Ozguzer, 2010), Microsoft Powerpoint (Tavin, 2010), virtual reality and avatars (Ballengee-Morris & Carpenter, 2010; Keifer-Boyd, 2010; Liao, 2010; Stokrocki & Andrews, 2010), video games (Patton & Kenyon), and Photoshop (Shin, 2010). This sampling suggests that the digital culture that is the contemporary moment has continued to require a response from art education researchers. It is also apparent with the scope of these investigations that there are a complex variety of actants within the technological ecology.

The edited collection of essays *Inter/Actions/Inter/Sections: Art Education in a Digital Visual Culture* also provides an opportunity to differentiate my approach in this research of building a social ontology of the visual technology Photoshop. Ryan Shin's (2010) article “Four Media Art Practices: Moving Beyond Drawing and Painting on the Computer” makes explicit reference to using Photoshop with preservice art educators to make digital art. Shin characterizes his students as having three “misunderstandings” about creating digital art:

- 1). “Students generally believe that digital art is simply an imitation of painting and drawing produced on a computer” (p. 42)
- 2). “Students think that digital art is made by the computer, not a

creative individual” (p. 42)

- 3). “Many believe that no concept or idea is required to make images with a computer” (p. 43)

Shin (2010) then goes on in the article to articulate four strategies and methods that he has used to counteract these misunderstandings by helping students “get away from exploring only technological effects, technology-driven artmaking” (p. 45). These four strategies focus on expanding the “concept of visual culture,” “criticizing visual-cultural sites,” working with multimedia through a range of audiovisual texts, and developing “creative ways to express ideas or concepts, rather than indulging in technical extravaganzas” (pp. 44-49). In order for Shin to disrupt his students' “misunderstandings” about using Photoshop to make digital art, the introduction of Photoshop is established within an asymmetrical relationship: Photoshop is a tool and you are the creative individual. Rather my approach, in recognizing actant symmetry in collaboration becomes an exploration of the non-human agencies of “technological extravaganzas,” a focus on Photoshop the actor-network as a “visual-cultural site,” and conceptualizing visual culture through a social ontology. Although Shin and I agree that using technologies with students is important, within this research I will explore the theoretical opportunities of understanding technological actants within symmetrical relationships with users in human-technological collaboration.

The shift that I am suggesting through a social ontology is to summon the force of the matrix-building perceptions of network technologies to all matters of

ontology: to strive to understand the network being of all things in their collaboration with learners. It is an effort to understand a thing not in the context of its socio-cultural impacts through its use by human beings, but rather a thing acting upon the world contributing agentially to culture and society through its social ontology.

This requires a shift from technology's pedagogical impacts through instrumentality that may in fact displace human agency as the singular import in understanding innovative technologies and learning. Human agency, as a concept that frames human action upon the sociological structures of the world, is transformed when re-conceived through this extended constellation of actants. Agency becomes multiplied into infinitesimal levels of scale that are not bound within limitations of larger sociological structures of "emancipation politics" (Latour, 2005, p. 52). As Tara Fenwick and Richard Edwards (2010) state,

ANT does not conceptualize agency as an individuated source of empowerment rooted in conscious intentions that mobilize action. Instead, ANT focuses on the circulating forces that get things done through a network of elements acting upon one another. (p. 21)

Instead, agency becomes the *doing something* of relational effects between actants that gather in network formations. ANT calls these relational effects translation (Brown & Capdevila, 1999; Callon, 1986; Latour, 2005), and it is the mapping of powerful translations that is central to understanding the social ontology. Therefore, agency is also multiplied through the relational effects of translation through actants that are themselves multiplied through human and non-human figurations.

Concepts of agency in emancipatory media pedagogies has had a

profound effect on how teaching and learning with technology constructs our understanding of both them (technologies) and us (teachers and students). Much of this discourse has focused on using these technological tools as a means to access cultural power through media representation (Jacobs, 2005; Kellner & Share, 2005; Macedo & Steinberg, 2007). However, this framework of agency limits not only those that have it, but also where it happens. It is the central exploration of this research to better understand the import of technology through understandings of an agency that is relational and doing something at many levels of scale. This notion of agency relies on the symmetry of actants and understands technologies beyond their usefulness as a tool or artistic medium. Instead, the actor/structure restriction of agency is diffused through the symmetry of actants to explore a social ontology that sees their varied contributions within a human-technological collaboration in all kinds of places and magnitudes.

Theoretical Basis for Understanding Human-Technology Collaborations

In pursuit of this human-technological hybrid, of central concern to this research, there is a shift in focus from innovative technologies perceived as instruments to collaborators within human-technology interactions. It is a shift to destabilize the certainty of objects as singular entities, and instead investigate the social ontology of things, in particular visual technologies such as graphic design software, in order to better understand their contributions to

collaborations with humans. As stated previously, I will draw on ANT sociological theories in order to facilitate part of this shift (Latour, 2005; Law & Hassard, 1999). ANT is particularly useful as a set of theories in the context of this research, because it positions objects as important actors within sociological formations or what is known as a “sociology of associations” (Latour, 2005). Objects do not replace human actors or dominate understanding of social interaction, but ANT scholars try to acknowledge the contributions by non-humans as just as important in understanding a sociology of associations. For ANT, a sociology of associations utilizes objects to “extend the list and modify the shapes and figures of those assembled as participants and to design a way to make them act as a durable whole.” (Latour, 2005, p. 72). Within this sociology of associations, objects have agency.

Another important component to investigate the social ontology of visual technologies is to better understand the complex relationships between digital technologies and theories of visual culture studies and how these intersect with ANT theories of non-human agents. While art education has had a longer history looking at technologies in the art classroom, only recently has the field of art education undergone a reconceptualization from disciplined-based art education to a field focusing on visual culture (Duncum, 2001, 2009; Freedman & Stuhr, 2004). Within visual culture art education there is more emphasis on semiotics (Smith-Shank, 1995; Smith-Shank, 2004), critical theory and cultural studies (Chalmers, 2002; Darts, 2004; Freedman, 1994; Garoian & Gaudelius, 2004b; Tavin, 2003), popular culture (Duncum, 1987; Manifold, 2009; Tavin, 2002; Tavin & Anderson, 2003), and digital visual technologies (Eisenhauer, 2006b; Keifer-

Boyd, 1997; Sweeny, 2004; Sweeny, 2005; Taylor & Carpenter, 2002). The focus on visual culture within art education has paralleled and drawn from broader scholarship in visual studies that has positioned the visual as an important site of socio-cultural meaning to communication in the 21st century (Mirzoeff, 1999; Sturken & Cartwright, 2009).

The movements of visual culture and digital culture, in both its perceived preeminence and its academization, have co-existed, but as the digital model for constructing and distributing information has expanded to include the visual, primarily through the advancement of computing speeds and the widespread availability of visual technologies, there is greater need to understand their confluence through conceptions of digital visual culture.

Although there is much scholarship moving in and through these two areas, two books¹⁰ have stated clearly a focus on the coming together of visual culture and the digital: *Visual Digital Culture* (Darley, 2000) and *Digital Visual Culture* (Bentkowska-Kafel, Cashen, & Gardiner, 2010). Both books go to great lengths to discuss a digital ecology of visual culture with chapters dedicated to computer animation, digital video, video games, music video, simulation, interactive art, science-art, and digital archiving. Both books concentrate on understanding the changing landscape of visual culture, in media and art spaces, within a digital realm of production. The bringing together of these two terms is instructive to understanding how they mutually inform one another, but extensive

¹⁰ As previously mentioned, the book *Inter/Actions/Inter/Sections: Art Education in a Digital Visual Culture* (Sweeny, 2010a) does make this explicit connection in the title, but is not only a focus on visual culture and the digital. Instead, it is focused on art education within these frameworks.

investigation into the complex nature of visual technologies, or as I have suggested an investigation of the social ontology of particular entities of visual technology, is largely absent.

Recent trends in research surrounding digital visual culture and media education, outside of the field of art education, have largely been discussions surrounding digital literacies as a set of new user practices (Gee, 2003; Ito et al., 2010; Jenkins et al., 2006; Thomas, 2007). Investigations of youth and social media have focused on social formations from offline/online connections (Watkins, 2010), community building (boyd, 2008), identity formation (Weber & Mitchell, 2008), and participation through user-generated content (Jenkins, 2006; Jenkins et al., 2006). Media studies researchers are developing ethnographic studies of youth and social media practices that convey a complicated web of opportunity and problems. These studies consistently recognize the important role that education plays in realizing the potential for learning that these technologies provide (Livingstone, 2009; Palfrey & Gasser, 2008). Through these research endeavors, the importance of understanding the potential of social media for education presents a learning opportunity without stating its overwhelming visual construction. As students inhabit network spaces, inside and outside of schools, the possible contributions of visual culture studies has been largely overlooked in this scholarship. As the technological ecology grows, the need to theorize the technological bodies that fill these spaces through collaborations with visual technologies in a digital visual culture becomes more necessary.

This perceived urgency is well articulated in the white paper from the

MacArthur Foundation titled *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century* (Jenkins et al., 2006). This white paper puts forward a call to educators to “devote more attention to fostering what we call the new media literacies: a set of cultural competencies and social skills that young people need in the new media landscape” (p. 4). Jenkins et al. contribute to an expanding discourse on literacy that takes into account the multimodal practices of today’s learners (Barton, 2007; Beavis & O’Mara, 2010; Gee, 2003; Thomas, 2007), but in particular how these practices are changing through collaboration and networking with Web 2.0 technologies and social media. What Jenkins and other digital media and learning scholars seem to imply is the centrality of network technologies in these new media literacies that relegate the role of visual production as tertiary to full participation; there is little more than an acknowledgement by the authors of art making as inherently good as a “creative process” used to “express” oneself (Jenkins et al., 2006, p. 7).

In many instances, art education that draws from theories in visual culture studies has led to many investigations of art and technology that go beyond notions of creative expression. Certain performance art has been shown to investigate identity formation and technology’s inscription upon the body (Garoian & Gaudelius, 2001, 2004a; Sweeny, 2008). The conception of the postmodern subject within visual culture studies places the performing student beyond a relationship of passive reception to media forms (Eisenhauer, 2006a). As Eisenhauer (2006a) states, “diverse and alternative understandings of visual

subjectivity emerge not simply as effects, but rather as active forces in the formation of diverse pedagogies” (p.166) that can empower students beyond a discourse of media bombardment. Digitally hybrid art practices of art collectives and critical designers, with a clear emphasis on engaging audiences in non-traditional art spaces, make work that speaks to their cultural, social, and political concerns through dynamic forms of collective intelligence (Darts, 2004). These works abandon the art object and redefine art as “an *event* that has a **performative and transformative side for society** through *doing* (**poiesis/enabling/fabulation**—not poetics) as productive desire” (jagodzinski, 2009, p. 339, italics and bold type by jagodzinski). Additionally, these *art as event* interventions rely on collaboration and networking to take advantage of a range of media outlets and expertise.

This gap between the enthusiastic potentials of new media and the understanding of how art classrooms figure into these potentials reflect upon broader perceptions of what is art education, but they also depend on seeing visual technologies as isolated tools within a changing landscape of network capabilities. In essence, the perceived power of social media and massive multiplayer online games (MMOG) is a tantalizing addition to the progress narrative of digital technologies, but concerns over the participation gap cannot relegate the importance of a collaboration with visual technologies as tertiary to its transformative power.

As students and faculty become a part of multimodal participatory cultures, art education can provide insight in theorizing and designing curriculum to meet the needs of participation through investigations of visuality. As Howard

Rheingold (2009) states, “since the unique power of the new media regime is precisely its participatory potential, the number of people who participate in shaping it, and the skill with which they make the attempt, is particularly salient” (para. 2). For Rheingold the power of new media productions is how we perform on them, and the range of new media literacies that Jenkins et al. are calling for in a media education of the 21st century draw heavily upon education’s ability to facilitate human-technology collaborations. As art educator Elizabeth M. Delacruz (2009) states, “kids and families, students and communities are plugged in, cued to the latest electronic developments and diversions, ready to creatively adapt them to their own purposes” (p 13). However, as adaptations go, our needs of participation rely heavily on an ability to utilize the visual technologies that are contributing to the force of new media in a visual culture. Better negotiation of the relationships that involve non-human partners, visual technologies, may result in increased participation that can undermine the hidden curriculum of new media education.

Research Questions

As the technological ecology grows for a generation of digital natives, there is greater need to conceive of the digital chimera that fill the spaces of participatory culture, because they are imbued with contextual practices that partially fill the potentialities of collaboration with them. The innovations of visual technologies in a digital visual culture occupy an importance beyond their

usefulness as a tool or medium for artistic practice in order to fully comprehend their affordances, gaps, and hegemonies. This shift in focus from how innovative technologies are perceived through their instrumentality to a reconceptualization as collaborators within human-technology interactions is the central preoccupation of this research. This shift is achieved through gathering social ontologies to see the complexity of things as they are deployed in the world. It is a shift to obfuscate singularity and instead to investigate the heterogeneous agencies of things, in particular visual technologies such as graphic design software, to better understand their contributions to collaborations with humans. Therefore, the central research question is

Using theoretical intersections of actor-network theory and theories of visibility, what is the social ontology of the visual technology Photoshop when it is conceived as a human-technological hybrid?

A series of sub-questions arise from the central focus that will be explored to develop the contributions that this research may offer to art education. From an art educator's perspective working through the lens of visual culture, theories concerning visibility may contribute to a wider field of interdisciplinary scholarship to better understand learning in a participatory culture. Part of the intent of this research is to better understand the ways in which innovative technologies add layers of meaning to explorations of visibility by shifting focus away from conceptions of technological tools to a more robust understanding of our human-technology collaborations. Therefore, a subquestion is

What does visibility in a network being offer to understandings of human-

technological hybrids?

Lastly, a major characteristic of the expanding technological ecology is its network formation or what Manuel Castells' (1996) calls the network society. If participatory culture is important to the learning futures of this digital native generation and subsequent ones (Jenkins, 2006; Jenkins et al., 2006; Rheingold, 2009) then relating the intersections of visibility and human-technological hybrids to participation may be productive in understanding contributions of this research. Therefore, another subquestion is

How might conceptions of visibility and the social ontology of human-technological hybrids effect participation in a network society?

Collectively, these questions look to the changing nature of students' digital practices within a technological ecology, and consider how theories from visual culture studies and ANT may respond to these evolving practices to re-conceptualize understandings of human-technological collaborations.

Rationale for Looking at Photoshop

With many technologies it is difficult to determine where one stops and the other begins. Where does an email message exist when it is uploaded from a mobile phone, then posted to a social networking site profile that ports it to a tweet from a connected Twitter account? To focus a study on understanding the visual technologies as non-human actants in collaboration with users could cast

a very wide net from computer animation to software that comes with your digital camera. It is my intention to narrow that focus to one piece of graphic design software: Photoshop. Even this narrowing comes with complication as to which version I am referring to: new versions of Photoshop are coming out about every 18 months. Positioning Photoshop within its connection to a complete suite of programs for different design professions, named Creative Suites by Adobe, or in relation to its less robust versions, such as Photoshop Elements, could become complicated. However, this complexity is part of our investigation as to its social ontology.

There is also the question of how to single out Photoshop when in fact many graphic manipulation options in multiple graphic design software exist. There is no doubt that the historical development of graphic design software must play a role in my research, but singling out Photoshop comes with a very good reason: I have taught with this software for eight years and continue to today. With so much experience with different versions, investigations in classrooms with students, and my own personal creative work, this research will most assuredly be in connection to my own long-term collaboration with this non-human actant. However, in addition to, and perhaps connected with, my own use of the software, Photoshop has achieved an almost transcendent recognition as *The* graphic design software. For home users and professional graphic designers, Photoshop has become parlance for all graphic design software and for the act of manipulating digital images in general¹¹. The dominance of this

¹¹ This phenomenon has reached almost comedic proportions in that the Adobe corporation has actually listed in its Photoshop trademark documentation that use of Photoshop as a verb or a noun is prohibited (Adobe, 2011h).

graphic design software is both in its widespread distribution of paid licenses and in its widespread pirating (Auer, 2008): Photoshop is here to stay. It is this dominance as an industry standard and my own long relationship with it that makes it a particularly good visual technology to explore as a non-human collaborator in producing digital visual culture.

Chapter 2: Literature Review

User's Guide

This literature review provides a trajectory for the emergence of an ontological focus within visual culture studies and theories of visibility. In order to investigate a social ontology of visual technologies like Photoshop, two central themes in actor-network theory (ANT) are used to facilitate this focus: 1) a richer understanding of non-human actors in their symmetry to humans in social agency as actants, and 2) a focus on ontological analysis to bare a different fruit than epistemology and social constructivism in relationship to visibility. Epistemology and the complexity of issues involved in representation is not without its place in this work, but the focus on an ontological perspective in the analysis, both through the heuristic devices that have been established thus far (technological ecology, digital chimera, and network being) and through the bodies of theory that focus on ontology in the social sciences, needs to be made explicit for the opportunities that it provides to understand collaboration with non-humans in a digital visual culture. With that in mind, it is my intention to first take up our non-human actors within the frame of posthuman discourses as a backdrop to

representation and theories of the subject¹² and its bodies that come with important contributions from discourses¹³ in feminist “technoscience” (Haraway, 1997, p. 4). This backdrop outlines various discourses that have focused on the non-human in relation to humanism, and generated deconstructions through feminist technoscience that open new spaces for thinking about the subject and technology in relation to history and society. These new spaces disrupt binaries in representation, particularly the male/female divide, through art and science fiction writing that begin to imagine a not-distant future filled with cyborgs and posthuman bodies. For certain feminist theorists, such as N. Katherine Hayles (1999) and Donna Haraway (1991; 1997; 1991/2000), these developments in the cultural framing of technologies within posthuman bodies provided an opportunity to construct new pathways to thinking outside of “Western logos” by questioning the subject's autonomy within human-technological hybrids (Haraway, 1991/2000, p. 310). This literature review begins by revisiting some of these critiques within feminist technoscience discourse to highlight trajectories meant to decenter the humanist subject as an important backdrop to understanding collaborations with non-humans.

Beyond this starting point, I will then continue to develop the “ontological

¹² The term “subject” has been used extensively in philosophy to designate the individual who experiences subjective experiences and consciousness. As an individual who experiences the world, the subject has been central in discussions of relationality to the material world and determining its constitution as an autonomous entity or produced through relational effects in such disciplines as critical theory and psychoanalysis.

¹³ I will refer to an assortment of research that weaves feminist politics with issues of science and technology that I am referencing collectively as the discourse of feminist technoscience. This assortment includes discourses that are variously labeled: cyborg feminism (Sandoval, 1995/2000), cyberfeminism (Plant, 1996/2000), technofeminism (Walcmán, 2004), and scholarship blending feminism and posthumanism (Halberstam & Livingston, 1995; Hayles, 1999; Toffoletti, 2007).

turn” (Escobar, 2007) provided through theories of ANT, by exploring the ontological framework through several theoretical resources including an understanding of a Deleuzian¹⁴ realist ontology and assemblage theory (DeLanda, 2006). Deleuze’s philosophy has a “realist ontology” because he is among “philosophers who grant reality full autonomy from the human mind, disregarding the difference between the observable and the unobservable, and the anthropocentrism this distinction implies” (DeLanda, 2002, p. 4). As such this realist positioning is taken into effect with social theory as a social ontology: the realist ontology that perceives things as mind-independent dynamic processes and applies this same autonomy to social entities large and small. As Escobar (2007) states, the “starting point is the realist stance of asserting the autonomy of social entities from the conceptions we have of them” in order to “convey a sense of the irreducible social complexity of the world” (p. 107). Assemblage theory, primarily drawn from the work of Manuel DeLanda (2002; 2006) shares many contact points with ANT in their mutual focus on ontology, but articulates its use of Deleuze much more explicitly, and in this research provides a useful bridge between Deleuze and ANT¹⁵. My intent is to include these speculations on ontology as a way of constructing a deeper understanding of the use of ontology in ANT theory through its understandings of Deleuzian realist ontologies, but also as a way to differentiate ANT’s ontology from these other coordinates in the

¹⁴ Although I will be talking about the philosophy of Gilles Deleuze it is impossible to disaggregate the contributions to the breadth of his philosophical discourse without considering his collaborations with Felix Guattari, especially in their three-part *Capitalism and Schizophrenia*.

¹⁵ ANT scholar Bruno Latour (2005) has noted that he was ready to drop actor-network theory as a name and replace it with “actant-rhizome ontology” (p. 9) that draws upon connections of ANT concepts (actants) and concepts such as the rhizome from Deleuze and Guattari (1980/1987). John Law (1999) has also drawn upon certain Deleuzian concepts in his formulations of ANT.

ontological turn. The purpose here is to focus on developing an understanding of ANT's reliance on an ontological focus, but also to situate that focus within philosophy and social science theory that is utilizing similar key concepts. One example of a key concept that is important to all of these ontological frameworks is the concept of assemblage. A large part of the literature review will be in developing an understanding of assemblage, and utilizing the various discourses from philosophy and social theory to provide a more robust understanding. Once my focus on ontology has been sufficiently established, the literature review will then turn to the project of bringing an ontological focus to visual culture studies by mapping the intersections of ANT and theories of visibility. These intersections begin assembling the social ontology of the visual technology Photoshop as the central actant of this research.

It is a significant crux of this dissertation that theories of visibility continue to build through the ontological turn in the social sciences lest they lose out on vital resources from the reservoir of opportunity that ontologies present. For this reason, I will highlight important concepts in both ANT and theories of visibility to then synthesize as a fleshing out of visual culture ontologies. Plotting the interactions of ANT and theories of visibility will provide new theory to understand visibility beyond representation, and contribute to understanding the heuristic devices that will be used throughout this study: technological ecology, digital chimera, and network being. Outcomes of this work in theory building will be used to differently frame collaborations with non-humans in producing digital

visual culture.

Posthuman Discourse and Cybernetics

The terrain of the actor-network makes its radical vision of reassembling society through the ways that it invites the non-human into the configuration of actants that constitute social space (Callon, 1986; Latour, 1988; 2005; Law, 1986). This blurring of human agency with its non-human counterparts pushes boundaries that differentiate the human body and its agency within collaborations with technology, which has given rise to not only ponder the future, but reason to re-evaluate the past (Gray, 2001; Hayles, 1999). Although ANT does not focus exclusively on technology, focus on the incorporation of human and computer gives rise to the posthuman: a radical rethinking of our liberal humanist inheritance from the Enlightenment that positions the body within the epistemology of data. Posthumanism (re)presents the body of flesh as a machine and the machine as a body, and suggests a blending of the two that requires rethinking relationships between knowledge and the body. The blurring of lines between human body and machine has contributed to fantasies of fiction, but has also asserted broader questioning of human autonomy. Are we autonomous beings with the unique power to be self-determined or does the Cartesian separation of the body and mind break apart when thinking through an embodied notion of cognition?

Posthuman discourse is constructed here inside of a larger cultural and epistemological trajectory that arose in the 20th century with Norbert Wiener

(1948) and the field of cybernetics. At its most essential a study of information and feedback, the evolution of cybernetics and its concepts has influenced other disciplines such as biology, engineering, cognitive science, and fiction. N. Katherine Hayles (1999), in her book *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*, provides a guide to the development of this science and its rippling effects in understanding the posthuman subject. Hayles' seminal book outlines three stages of cybernetic research: homeostasis, autopoiesis, and emergence. Weaved throughout this history of cybernetic research is the deconstruction and reification of the liberal humanist subject of the Enlightenment, the questioning of the ultimate objectivity of scientific research, and the development of the cyborg within the public imagination through science fiction authors such as William Gibson, Bernard Wolfe, and Phillip K. Dick. Hayles uses the writing of the pioneers of cybernetic theory and the novels of these science fiction writers to weave an analysis that ultimately questions a teleology of reality, a completeness that has been brought under question by the very rationality of scientific investigation that once unified the Enlightenment subject. As her title suggests, it is not a question of the future; we became posthuman because we already were.

Of central concern to the analysis that Hayles develops is the role of the body in the development of the posthuman subject that is brought on by the collapse of human-machine distinctions. From the beginning of cybernetic studies, there is a tension between the importance of information versus the

importance of embodied experience in understanding the parameters of thinking. Human cognition could be conceived as a series of information processing, but experience in a body, or embodiment, complicates modeling the mind as a straightforward information processor. In its earliest stages, summarized by Hayles (1999) as the homeostasis phase of cybernetics, the emphasis was on pure information without context and a denial of embodied knowledge. It was not that the body did not matter, but that it created noise in processing pure information; removing the body meant a better understanding of the feedback loops of human experience.

The focus on a feedback loop of information ultimately led to the concept of reflexivity in the processing loop. In what Hayles (1999) attributes generally to the observer, the act of reflexivity “*is the movement whereby that which has been used to generate a system is made, through a changed perspective, to become part of the system it generates*” (p. 8, italics is Hayles). This phase in the development of cybernetics, termed by Hayles as autopoiesis focuses on self-organizing systems that locate themselves within boundaries of containment and ultimately is a study of systems within systems. This shift to autopoiesis radically undermines the presupposition of a world out there to be coded and processed, and instead injects the observer as a matrix of feedback loops, each contributing and constructing the world. Although autopoiesis presents a significant leap from the emphasis on information and a return to the materiality of embodiment, Hayles suggest that it stops short of jettisoning a liberal humanist subject in the ways that it emphasizes the closure of feedback loops in circularity to the observer. Hayles (1999) states:

the foundational ground for establishing the subject's autonomy and individuality has shifted from self-possession, with all of its implications for the imbrication of the liberal subject with industrial capitalism. Instead, these privileged attributes are based on organizational closure (the system closes on itself, by itself) or on the reflexivity of a system recursively operating on its own representations (the observer's distinctions close the system). (p.146)

Closure and recursivity then provide the same conceptual framework that self-possession provided to the bodiless and information-rich model of homeostasis found in formulations from the first wave of cybernetic theory. It is not until the third wave, which Hayles terms emergence, that we see a posthuman subject that is at once conceived as embodied and grounded in multiple subjectivities. In the emergence phase of cybernetics, predominantly perceived through the research generated around Artificial Life, embodiment is asserted within the matrix of information that a virtual body becomes a continuum of the boundaries of the posthuman. Hayles (1999) uses the concept of the virtual to disrupt the material/information binary of previous waves of cybernetics, because it is inextricably intertwined data and embodiment. Information cannot be understood outside of the contextual body that constructs it.

In her conclusion, Hayles makes an effort to engage the posthuman in what it might mean going forward. She acknowledges the fear of a confrontation with the posthuman and human in an evolutionary clash, but ultimately advocates for a position of opportunity. For Hayles (1999) the posthuman offers a view where

emergence replaces teleology; reflexive epistemology replace objectivism,

distributed cognition replace autonomous will; embodiment replaces a body seen as a support system for the mind; and a dynamic partnership between humans and intelligent machines replaces the liberal humanist subject's manifest destiny to dominate and control nature. (p. 288)

Hayles' frameworks for the emergence phase of cybernetics provides a space for a human-technological hybrid that operates in multiple bodies and through multiple agencies both human and technological.

Decentering the Humanist Subject in Postmodernism

The ultimate challenge from posthuman discourse comes from the ways that it reformulates how the subject of history is positioned in a relational tension with non-subjects. In other words, how does the subject work within culture, within relationships to nature, within/out bodies, in history, and in society when it is perceived as an embodied emergence co-constituted with the worlds and phenomenon that it inhabits? This mixture of positions for the subject provides tensions for constituting how or why the subject is constituted at all, and forefronts a need to first position the subject as it then becomes filled and displaced in discourses of social theory such as posthumanism. As Roy Boyne (2001) states

What do we mean by the subject? At its core is the idea of an autonomous principle of judgment. A prototype of this principle is based on the idea of single individual human beings who are able freely to decide upon the actions that they take within virtually all social and personal contexts. The site of the decision process, in this view, is the individual consciousness, and although it can be compromised by drugs, emotional turmoil, physical duress, and by the artful manipulations of others, and even though it can never be certain of the authenticity of its own condition, in its normal form it is sufficiently powerful to be autonomous, discerning and, therefore,

responsible for its own actions. This view of the subject is a basis of the day-to-day understanding of the self within Western society. (p. x-xi)

Boyne's characterization of the subject shares a similitude with the liberal humanist subject that is given birth in the Enlightenment as a rational and autonomous individual (Boyne, 2001; Hayles, 1999), and is in large part what contemporary cultural and social theory works against (During, 1999). The push back against the liberal humanist subject from areas of cultural theory, particularly that of feminist technoscience and posthumanism, critiques the assumptions of autonomy within a "modern Western culture" (During, 1999, p. 10). Simon During (1999) sees these efforts to push back on the liberal humanist subject as efforts to understand a subject that "cannot be reduced either to the managerial self that chooses styles, strategies, and techniques of self-formation or to the subject positioned by external fields and discourses" (p. 11). Instead this "decentering" (Huysen, 1986/1993, p. 230) suggests that subjects exist in frameworks of complex relationships between the body, language, and material events.

This push back offered through critique of the autonomous subject is not universal in its relationship to humanist discourses: take for example the edited collection of essays found in *Critical Humanisms* (Halliway & Mousley, 2003). Martin Halliway and Andy Mousley's text is a deconstruction of universal humanism in the project of disrupting the essential subject of humanism, and in

opposition to their framing of anti-humanist discourse (posthumanism being one of the “anti” variety). Halliway & Mousley's (2003) argument rests on the notion that anti-humanist discourses, broadly defined within the movements of post-isms in the humanities, can be viewed as “a closet humanist text which avoids the essentialism so often associated with humanism...and merely replaces one kind of subject (as core) with another (as linguistic/social process)” (p. 15). However, there is no irony lost on this author for the metaphor of the closet that they invoke, and the very real terror of being closeted in society. Their formulation appears to evade the essential reason for the push back that decentered the subject through the posthuman in that it may offer a more equitable imaginary. As Judith Halberstam and Ira Livingston (1995) state “the posthuman marks a solidarity between disenchanted liberal subjects and those who were always-already disenchanted, those who seek to betray identities that legitimize or delegitimize them at too high a cost” (p. 9). This pushing back against the humanist determinations of the subject returns to Hayles (1999) revisionist positioning of already being posthuman to question the determination of the subject as it is constituted through the inheritance of an Enlightenment subject. The Enlightenment provided a grand narrative that would determine how subjects would perform within society, in that it characterized a world that “runs by immutable laws that are knowable and that can be exploited to advance the human condition” (Rifkin, 2001, p. 188). Disrupting notions of autonomy and rationality within this inheritance provides a foundation to a very different subjectivity.

It is important to note that just as Hayles (1999) discusses the

intersections of cybernetics and notions of the subject in society, there is as well effects of the acceleration of technological networks and screens that are changing social relations the world over and in turn the constitution of the subject. Media theorist Mark Poster (1995/2006) speaks directly to the intersection of a “postmodern subject” (p. 539) and the rise of decentered network technologies of the Internet and the virtual realities that they provide. An important concept to the postmodern is Jean-François Lyotard’s (1979/1984) concept of the breakdown of metanarratives to smaller, discrete narratives, so what you have is a web of newer “localized narratives” (Haber, 1994, p. 27) that rise up in a polyphony of meaning that question the notion of the whole or unified subject. Angela McRobbie (1985/2006) in “Feminism, Postmodernism and the ‘Real Me’” investigates this very terrain by searching to know the “real me,” but what she asserts is that there isn't one. Subjectivity is composed of shifting boundaries constructed by a poststructural shift in meaning. From the postmodern viewpoint, the notion of a whole self comes unhinged and subjectivity is found lacking, overflowing and/or shifting constantly. This allows a new sense of critique for modern essentialism and a new modality informing ways of knowing that eclipse terrorized/territorialized Others. For McRobbie (1985/2006), the postmodern allows the feminine to break apart and be discursively re-formulated, with other entrapments, but in flux.

Cyborg Feminism

As theories of the posthuman questioned the autonomy of the Enlightenment subject and postmodernism destabilized unity in the subject, new concepts in feminist theory arose to theorize the subject and political agency that simultaneously draw from the postmodern cultural shifts in meaning and the multiplied prosthetic body of technology in posthumanism. Donna Haraway's (1991/2000) "A Cyborg Manifesto: Science, Technology and Socialist-feminism in the Late Twentieth Century" is a pivotal writing in mapping the new terrains of postmodern subjectivity and feminist theory. Haraway uses the cyborg as a political metaphor for subjectivity because it "is a creature in a post-gender world...skips the step of original unity, of identification with nature in the Western sense," and is "resolutely committed to partiality" (p. 292). For Haraway the cyborg "is our ontology, it gives us our politics."

In her manifesto, Haraway maps the Neo-Marxist theorization of gender through its entrapments of second-wave feminism as defined within Western, white, middle-class identity politics that alienated broader conceptions of the feminist movement that would utilize the intersubjectivity of race, class, and sexuality that play crucial roles in social inequities. Within these exclusionary parameters, coupled with the collapse of human and machine binaries, Haraway (1991/2000) searches for possibilities of re-defining a contingent and un-unified subjectivity that can "learn from fusions of animals and machines how not to be Man, the embodiment of Western logos" (p. 310). The effects of the cyborg as socialist-feminist politics not only relies on a multiplicity of the subject and its

boundaries, both physical embodiment and consciousness, but also asserts a feminist politics to the scientific endeavor itself or a “feminist science” (p. 310).

As Haraway (1991/2000) states:

Cyborg imagery can help express two crucial arguments in this essay: first, the production of universal, totalizing theory is a major mistake that misses most of reality, probably always, but certainly now; and second, taking responsibility for the social relations of science and technology means refusing an anti-science metaphysics, a demonology of technology, and so means embracing the skillful task of reconstructing the boundaries of daily life, in partial connections with others, in communications with all of our parts...Cyborg imagery can suggest a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves. (p. 316)

The cyborg then is a tactical metaphor that breaks from the metanarratives of binaries, through the techno-scientific hybridity of machine and animal embodiment, and charts a course for a postmodern subject within a “network ideological image” (Haraway, 1991/2000, p. 307).

The image of the cyborg becomes a potent vision; authors such Sadie Plant (1996/2000), in her article “On the Matrix: Cyberfeminist Simulations,” begin to theorize the cyborg body in feminist politics both in the ways that it disrupts boundaries of the body, but also for the power with which it re-asserts the feminine in a rapidly expanding technological ecology of the 1990’s. With home computers on the rise, networking machines connecting universities and businesses, and the World Wide Web being open to the public in the middle of the decade, the technological fervor of this time period appeared to be a hot bed of change. For Plant, the reconfiguration of societal connections and corporate

globalization brought on by computer networking provided a limitless opportunity for cyberfeminist. Plant (1996/2000) states:

Cyberfeminism is an insurrection on the part of the goods and materials of the patriarchal world, a dispersed, distributed emergence composed of links between women, women and computers, computers and communication links, connections and connectionist nets. (p. 335)

Plant (1996/2000) advocates for the opportunities of a multiplicity in subjectivity that Haraway had seen in the cyborg, and foresees it as a viral infection of patriarchy, “perverting the codes, corrupting the transmissions, multiplying zeros, and teasing open new holes in the world” (p. 336). Plant’s somewhat hyperbolic proclamations for cyberfeminists assert an enthusiastic projection of technologies in eroding the domination of women in patriarchal societies, and charts a course that eludes determinist assertions concerning the nature of technology.

Not all feminist theorists were as enthusiastic. Judith Squires’ (1996/2000) article “Fabulous Feminist Futures and the Lure of Cyberculture” takes a more critical stance on the enthusiasm for what she calls “technophobic cyberdroll” (p. 360). Her concern with the cyberfeminism of Haraway and Plant is the danger of an apolitical stance, one that rejects Enlightenment values entirely, even those of democratic and pluralistic values, and investigates the nature of the self, a persistent part of Western male desire for agency, control, and autonomy. Squires (1996/2000) states, “we cannot assume that the current cybernetic developments will not also result in ontologies that, although redrawn, are none the less highly gendered” (p.362). For Squires, the euphoria of technological innovation, which brought on fantasies of the cyborg, has also brought on fantasies of eclipsing the body and materiality. Squires states:

cyberfeminism has become the distorted fantasy of those so cynical of traditional political strategies, so bemused by the complexity of social materiality, and so bound up in the rhetoric of the space-flows of information technology, that they have forgotten both the exploitative and alienating potential of technology and retreated into the celebration of essentialist, though disembodied, woman. (p. 369)

What Squires brings to the development of the cyberfeminist movement is an interrogation of technology's entrapments within its overly patriarchal deployment. For Squires, the cyborg is a reification of man as machine in the continued search of the autonomous subject within the scrambling boundaries that the cyborg image displays.

To maintain conceptions of the posthuman subject as cyborg, within these hazards, returns to the concepts of emergence and virtuality that frame Hayles (1999) third wave cybernetics, and augment these frames of the third wave to allow the posthuman subject to be constantly (in)formation: a subject emerges through its virtual becoming. Hayles' (1999) use of the term "virtual" falls in line with how we conceive of virtual reality in online spaces, or the "*the cultural perception that material objects are interpenetrated by informational patterns*" (pp. 13-14, italics by Hayles). From examples such as DNA code in the biological body to online virtual realities, the intersections of data and the body provide feedback loops that are both materially constructed and inscribed through information. The relationship between data and material is not a real and unreal one, but rather a complex series of feedback loops that "run between technologies and perceptions, artifacts and ideas, [and] have important

implications for how historical change occurs” (Hayles, 1999, p. 14). This relationship also causes a rethinking of the defining characteristics of the materiality of digital bodies, or data-bodies, that do not have the hallmarks of tangibility that a material might be assumed to have.

The term “materiality” indicates a theoretical approach that focuses on physical things as one starting point for building an understanding of thought and behavior (White 2009). In particular, materiality is intertwined with the digital as the phenomenon of software, user interfaces, and code structure are all explicitly a part of the material of the digital computing era but have no tangible surface or quality which returns to the notion of data-bodies in posthumanism. The term "digital materiality" does not yet have a fixed meaning, but it has been used to refer to the physical manifestations of the computer age (Manoff, 2006), to the processes by which digital representations become physical architecture (Gramazio & Kohler, 2008), or to the effects of digital information in the modern world (Leonardi, 2010). Many of the discussions of materiality dwell on its nature as matter, as things and objects, but devolve quickly into indeterminacy as digital materiality rears its head in social interactions. As sociologist Timothy Pinch (2008) discusses the relationship between digital technologies, specifically software, and its material status, he states:

The word ‘material’ here seems to signify a practice that is grounded in the everyday, in the world of material things and may involve the exchange or manipulation of material things but by and large the materialness of the things does not itself figure in the analysis. (p. 464)

However, materiality has also been defined as to its properties to do something, or what science and technology studies scholar Andrew Pickering (1995) calls

“material performativity” (p. 7). Pickering's emphasis is on the practice of science, but a cultural practice experiences the same effects of material agencies that circulate in the laboratory. Pickering (1995) states

Scientists, as human agents, maneuver in a field of material agency, constructing machines that, as I shall say, variously capture, seduce, download, recruit, enroll, or materialize that agency, taming and domesticating it, putting it at our service, often in the accomplishment of task that are simply beyond the capabilities of naked human minds and bodies, individually or collectively. (p. 7)

So there is a world of material agencies doing things in the world, but that doing is never alone: the digital materiality of something like software is not tangible matter, but rather its material agency to interact with its human counterpart accounts for certain character of materiality. Material performativity is then a part of the posthuman subject, a multiplied intersection of bodies and agencies that compose the human-technological hybrid.

This concept of material performance is further framed through Hayles' (1999) use of the idea of “seriation” or a pattern of overlapping innovation and replication that occurs through the historical development of digital technologies (this type of seriation was also formulated through the metaphor of the digital chimera in Chapter 1 to understand the seriation of broadcast to network media). For Hayles, patterns of seriation through the development of cybernetics indicate a give and take between the conceptual evolution of information processing and their material artifacts. One can think of the concept of the cyborg as a product of this seriation as concepts of artificial intelligence, pioneered through conceptual

frameworks of autopoiesis, flooded the public imaginary through science fiction, popular culture, and eventually feminist cultural theory. As the emergence phase frames the body within the feedback loop, feminist theory was able to seize upon a historical moment that strategically wielded the type of revisionist concepts as the cyborg and the posthuman that disrupt binaries that is evident in the work of Haraway (1991; 1997) and Hayles (1999). However, as Squires (1996/2000) suggests, the possibility of escaping binaries strictly framed through technological cybercultures run the risk of essentialism in both framing the cyber-women and dematerialized technology. Somewhere between the technicity of cybercultures and embodiment lies the material performance of the posthuman subject.

Re-assembling the Posthuman

It is precisely within this tension between a posthuman embrace of technology that decenters the subject through human-technological hybrids and cyberculture's potency for essentialism where I would like to augment posthuman discourses through assemblage theory (DeLanda, 2006). Philosopher and social theorist Manuel DeLanda's articulation of assemblage theory builds from a Deleuzian concept of the virtual within ontology, because undertaking Deleuze's realist ontological view of the world forefronts a rejection to formations of autonomy and a denial of any sort of transcendent entity due to inner essence (DeLanda, 2002). Instead, ontology is understood as dynamic processes of both matter and energy involved in intensive differences that are immanent to the material world. Vital to the potentiality within these intensive differences is their

virtual dimension, which refers to “the modal relation of possibility or potentiality vis-à-vis actuality for complex systems” (Bonta & Protevi, 2004, p. 164). This virtual dimension allows for entities to remain heterogeneous in a realist ontology, not reducing them to a singular essence, but instead placing them within a multiplicity. As Escobar (2007) states in reference to assemblage theory, “actualization of the virtual in space and time entails the transformation of intensive differences into extensive (readily visible) forms through historical processes involving interacting parts and emerging wholes” (p. 107). This dynamic dimension of the virtual in ontology helps to form one of the foundations to assemblage theory, which focuses on these interacting parts and emerging wholes and is conceived within this study as a way out of the technicity of cyborgic formulations of posthuman decentering. In order to elude the cul-de-sac of posthumanity in its technological, which may actually remove posthuman discourse from bodies and materiality (Squires, 1996/2000), the virtual dimension provides an ontology that can be mobilized for its difference and relevant for its contingency. This contingency is the vital source of the actant in ANT: “the being of an actant is contingent upon its capacity to act, and its capacity to act is reliant on other actants. The centredness of agentic responsibility is distributed into a dispersed network of interdependencies and co-responsibilities” (Lee & Stenner, 1999, p. 93). Therefore through assemblage we find a way to re-inscribe the relatedness of actants that are temporarily assembled and held together, not necessarily or absolutely through the cyborgic

body, but through and with the actants that form actor-networks. As ANT scholars Ingunn Moser and John Law (1999) state in reference to their research subject, Liv, who is physically disabled:

She is indeed a cyborg, yes, in an obviously material sense, but is a person, yes, a modern western subject, whose struggles to achieve that normative form of subjectivity make it easier to see what is at stake for all of us. For all of us as we make , are made by, good passages and bad passages. As we make and are made by the desires for continuities and discontinuities. As we weave, are woven, in the partial connections, in the particular oscillations, and dis/continuities of normative subjectivities. (p. 215)

It is of particular worth in moving forward in my use of ANT, that not only is the decentering of the humanist subject a part of that trajectory, but also the potential for the “dis/continuities of normative subjectivities” to lead to particularly “messy” formations (Law, 2004b). This is another strategic moment to re-inscribe the method of assemblage in that my objective through ANT facilitates a search for constituting assemblies, gesturing towards what is assembled within a particular actor-network, and not in defining actors or networks in their totality. Assembling is an important methodology to ANT, and at this point I shift focus to assembling one of the actor-networks of this dissertation: visuality. In order to arrive at this assembly I begin by laying out some important nodes for my understanding of ANT theory and then move onto laying out important nodes for theories of visuality which will allow us to begin assembling the two into the actor-network.

Important Nodes in ANT: Actants, Translation, & Assembling

In the early development of ANT theory there is an emphasis to build new social science theory adjusted to the study of science and technology (Callon, 1986; Latour, 1988; Law, 1986). These investigations stemmed from a desire to understand the dramatic advances that contemporary history has experienced in relationship to science and technology, so that ambiguities of the grandiose ascension by scientific reason may be better understood through human sociology. Latour (1991/1993; 2005) asserts that sociological investigation of science and technology was of such a disruptive force to the assumptions surrounding the science of objects (biology, chemistry, physics) and the science of humans (anthropology, sociology), that it required a complete rethinking of sociology itself in order to bring its instruments to the science of laboratories. It is important to note that ANT is not alone in its pursuit to understand the sociology of science and has received some of its most rigorous critique from these alternate positions. Donna Haraway (1991; 1997) in her approach to feminist technoscience, has theorized human to non-human interaction, and her critiques have spurred ongoing refinement of the ANT discourse (Law, 2000). As mentioned above, Haraway's (1991) theories of the cyborg deny a privileging of the human actor in sociology, and instead grasps to understand the interpellation of humans and non-humans in a way that continues to perceive tensions in "situated knowledges" (p. 189) or those ways of knowing that are embodied. For Haraway (1997), ANT is too involved in science and technology and accepting of

the “modest witness” as scientist (p.29). This acceptance denies how “situated knowledges” infiltrate scientific inquiry, and subscribe to a sort of unfettered objectivity. In Haraway’s (1997) *Modest_Witness@Second_Millennium.Female_Man(c)_Meets_Oncomouse(tm): Feminism and Technoscience*, she describes the socio-historical construction of the scientist as a “modest witness” to the phenomenon of study, but juxtaposes this ideological objectivity with the very real discrimination against women and people of color that barred them from occupying this scientific subject. The inattention to the inequalities of the scientific subject leave ANT, and indeed much discourse surrounding technology, vulnerable to perpetuating or ignoring the ongoing importance of situated knowledges within discussions of technology and innovation. Instead, Haraway (1997) would have us ask, “how do we queer the modest witness this time around?” (p. 35). This is an important concept to maintain as the more detailed components of ANT are reviewed in the following pages.

One early gesture adopted by ANT scholars to re-think social science inquiry was through the rejection of prior movements in sociology that rely on epistemological formations of a pre-existing something called the “social.” Latour (2005) states, “when social scientists add the adjective ‘social’ to some phenomenon, they designate a stabilized state of affairs, a bundle of ties that, later, may be mobilized to account for some other phenomenon” (p. 1). Instead, ANT set out a revision of social sciences by calling for a return to a “sociology of associations” over a “sociology of the social” (Latour, 2005, p. 9), where actants are followed in their performance of the social, the economic, the educational,

and in whatever spaces of the ontology in which they are found. The ANT objective is to understand how these actants come together, and manage to hold together even if temporarily, to form associations that produce agency and other effects. The ANT critique surmises that the “social” has become a field of predefined relationships that is put onto actors in the science of sociology, and instead ANT scholars “define the social not as a special domain, a specific realm, or a particular sort of thing, but only as a very peculiar movement of re-association and reassembling” (Latour, 2005, p. 7). This first gesture repositions the vantage point for ANT inquiry from one that tries to define social interactions or categorize them, and instead looks methodologically¹⁶ to understand the temporary or durable associations in their effects.

As a part of this methodology, perhaps the most important is the new status of the non-human: symmetry, first suggested by Bloor (1976) and then elaborated by Latour (1987), in ANT supplies both humans and non-humans agentic possibility within the effects of associations. This symmetry is a part of Latour’s (2005) five “uncertainties” to inform ANT in this return to the sociology of associations, and John Law (1999) calls this focus on objects a “semiotics of materiality” in that ANT “takes the semiotic insight, that of the relationality of entities, the notion that they are produced in relations, and applies this ruthlessly to all materials—and not simply to those that are linguistic” (p. 4). This departure

¹⁶ I want to avoid confusion between ANT as a theory and ANT as a methodology. As many proponents of ANT scholarship suggest, ANT is not so much a solidified body of theory, but rather a way of approaching sociality through a collection of theories and philosophies surrounding poststructuralism, sociology of science and technology, ontology, assemblage theory, and feminism (Latour, 2005; Law, 2004b; Law & Hassard, 1999). It is more a “way to intervene, not a theory of what to think” (Fenwick & Edwards, 2010, p. 1).

from the focus of much social science scholarship is the tour de force of ANT, and when pushed to its conclusion leads ANT scholars to reassemble a social world composed of both human and non-human actants. Objects are not to replace human actors within a social ontology, but contributions by non-humans become just as important in understanding a sociology of associations.

These associations of non-humans and humans can form temporarily or attain a certain durability through space and time through the ways that actants “persuade, coerce, seduce, resist and compromise each other as they come together” (Fenwick & Edwards, 2010, p. 4). Associations that attain some sort of durability are referenced as a “black box” (Latour, 1987, p. 4) where their inner relations and heterogeneity of associations become masked; ANT scholarship focuses on following actants closely to look inside the “black boxes” of social practice, resisting explanations attributed to relationships of causality, and searching to understand the correlations that erupt through associations. When compared to a traditional notion of substance in metaphysics as a singular entity that is then modified through human intervention, for example through philosophers such as Spinoza and Leibnitz (Brown & Capdevila, 1999), the notion of the black box replaces traditional substance with a concept that explodes, like a 3D diagram, the world of objects into intricate complexities of association (Harmen, 2009). A good example of a black box would be Apple’s mobile media player the iPod, because its use relies on inputs and outputs, but when the device breaks down we suddenly have a very different relationship with it. Similarly, we can apply this black box concept to all matter and non-matter of the social world: consider the heterogeneity of associations that compose notions

of identity, a community recreation center, or an art history textbook. This range of materiality represents the many (con)figurations of our actants: whether they be objects, bodies, or texts (Law & Hetherington, 2003).

An important component to understanding the actants in social ontologies and their associations is to differentiate between intermediaries and mediators. In the above example of the iPod, we may never encounter the device beyond its instrumentality until it breaks, or until we find out that we can hack it by loading another operating system on the hard drive (see Stern, 2004). This transition from the black boxed thing, iPod as media player, and the thing that does not work in the ways that we would like it, iPod as broken or restricted in use due to proprietary software, is important in understanding what actants to look for in an ANT methodology. Intermediaries are “what transports meaning or force without transformation: defining its inputs is enough to define its outputs,” and by contrast mediators “transform, translate, distort, and modify the meaning or the elements they are supposed to carry” (Latour, 2005, p.39). The intermediary or mediator character of the actant does not indicate a level of complexity; as the iPod example indicates, because the iPod can be seen as a technologically complex intermediary.

This attribution of agency is transitory in understanding a sociology of associations in that non-humans and humans can go between states of mediators and intermediators: what is paramount is what you are assembling through associations to the extent that some ANT researchers consider the

theory itself as a “sociology of translation” (Brown & Capdevila, 1999).

This brings us to our next important understanding of ANT: the issue of translation. For ANT, translation takes on the somewhat special meaning of “a relation that does not transport causality but induces two mediators into coexisting” (Latour, 2005, p.108). The translations of mediators leave traceable associations through actions and these are the make-up of the network that is accounted for in a sociology of associations. Therefore translations are the interactions of actants as they form into network configurations, and can be characterized by the same sense of temporality that was used in reference to associations. The key element to translation is that the very basis of translation is not only the actants in connection, but in relationships of transformation: a translation results in actants acting upon one another through forces, negotiations, resistance, and exclusions that forge micro-relationships. Translation is “the process...which generates ordering effects such as devices, agents, institutions, or organizations” (Law, 1992, p. 366).

When actants are involved in translation they are mobilized in the network to perform knowledge in certain ways that is fostered by the relationships that have been forged through their interactions with other actants. This is what makes translations non-deterministic: the formations of actants within social ontologies present an infinite variety of possible outcomes for not only the particular actor-network that the actant is in translation with, but also for the inter-actor-network complexities that define the social landscape according to ANT. This spiraling complexity of actants within translation within actor-networks has been critiqued for its endless connectivity (Miettinen, 1999), but is also the same

approach that assemblage theory takes to assembling component parts into emerging wholes (DeLanda, 2006; Escobar, 2007). Although this complexity does appear overwhelming, this critique can undervalue the complexity of supposedly simple systems while conflating notions of complexity and the complicated (Norman, 2011). The world is filled with technologies and designed objects that are complex, but understanding them through deep structures that can uncomplicate, but maintain complexity is an important part of the work of ANT. In addition, a critique by means of complexity implies that there is a way to avoid it through other methodological means, but to suggest that a methodology such as ANT is faulted due to its impossible complexity overlooks the very choices involved in any research endeavor that always already are a series of reductions. Instead, this complexity will be seen as the impossible framework within which all research is conducted, and ANT presents to researchers a choice of where to “cut the network” (Strathern, 1996).

What this complexity does showcase is that actants in translation maintain a certain symmetry that does not suggest a hierarchy in status or power reducible to themselves, but rather power is garnered through increased alliances through network connectivity. Following actants in translation “shows that all are fragile and all are powerful, held in balance within their interactions” (Fenwick & Edwards, 2010, p. 10). Therefore the notion of the assemblage and its building through the research endeavor is of vital importance to any ANT project. Understanding the assemblage becomes the main operation of ANT for

its effects in social practices, the translations that it requires to remain in relation, and its durability. Assemblage draws significantly from all of the movements of ANT that I have outlined thus far: actants in their symmetry are important contributors to the assemblage, mediators are powerful assembling catalysts that work actants through translation into networks of associations, and the chief operation of assembling avoids filling social practices with “social stuff” unless they are within the space-time duration of the assemblage. There are two further characteristics to the assemblage that inform our ontological practice and these characteristics will be drawn from assemblage theory (DeLanda, 2006): issues of scale and flatness.

Just to reiterate, the use of assemblage theory in conversation with ANT is an inclusion that highlights many of its existing overlaps, draws out more clearly relationships to the philosophy of Deleuze that are more implicit to ANT, and reinforces the broader interest in ontological perspectives to the social sciences. Therefore, I want to draw out characteristics of scale and flatness of assemblage using Manuel DeLanda’s (2006) summaries of assemblage theory from his book *A New Philosophy of Society*, from which I will list some main characteristics, but ANT scholars have also touched upon these concepts (Latour, 2005; Law & Hassard, 1999). First, the theory of assemblage relies on a metaphor of bringing together interacting parts into a relational whole that are forged by translations through associations. The interacting parts that account for assemblages should be understood as “self-subsistent and articulated by relations of exteriority” (DeLanda, 2006, p. 18). What this allows is that parts are not determined by their relationships interior to the whole, but rather components that may be detached

and made a part of another assemblage. Second, two dimensions characterize assemblages: 1) the different roles that the component parts may play in forming the assemblage, and 2) the processes that these components are involved in. In the first dimension the components may play a purely material role or an expressive role or a mixture of the two. Gilles Deleuze and Felix Guattari (1980/1987) name this double articulation of material and expression as “strata.” In the second dimension, components become involved in processes that either stabilize (territorialization) or destabilize (deterritorialization) the identity of the assemblage. DeLanda adds a layer to this second dimension of processes by the role that media can play in coding and decoding processes. DeLanda (2006) defines the processes of coding and decoding as

an extra axis defining processes in which specialized expressive media intervene, processes which consolidate and rigidify the identity of the assemblage, or, on the contrary, allow the assemblage a certain latitude for more flexible operation while benefiting from genetic or linguistic resources (p. 19).

This extension of processes to territorialize and deterritorialize the identity of assemblages through an added layer of “genetic or linguistic” resources is important to this study in that I would add visuality to this axis. Finally, these processes through which assemblages come into being are recurrent which relays assemblages into large or smaller formations of scale due to the repeated occurrence of the same processes.

This brings us to our first characteristic of scale. Due to the component

parts of assemblages, we can begin to see a sort of fractal realization of the network formations that overlay associations: humans and non-humans relate, institutions and non-humans relate, nation states and institutions relate, and so on at many levels of scale. The important part of this concept is that these relational formations are interconnected through scaling up. As DeLanda (2006) states, “it is only by experiencing this upward movement, the movement that in reality generates all of these emergent wholes, that... [you] can get a sense of the irreducible social complexity characterizing the contemporary world” (p. 6). This upward movement helps to locate the intermediaries in the complexity of social relationships so that there is not a reduction to micro and macro levels. From this perspective, the micro to macro framing utilized in the social sciences is critiqued for not only its reductionism, but also its focus primarily on social structure (DeLanda, 2006; Escobar, 2007). Instead, assemblage and the conceptualization of scale allows for seeking the historical production of the assemblage without over-simplification in using history to divine originary tales. Scale emphasizes the recurrent processes of assemblage, and keeps us mindful of an assemblage coalescing in a world of existing assemblages that it then works through and within networks of association. And finally, scale keeps our focus on the multiplicity of assemblage formation that goes well beyond binaries of micro and macro, and instead into the world where “assemblages, being wholes whose properties emerge from the interactions between parts, can be used to model any of these intermediate entities” (DeLanda, 2006, p. 5).

Theories of assemblage, from both ANT scholars and theorists like DeLanda, are both drawing resources from what anthropologist Arturo Escobar

(2007) calls an “ontological turn” in the social sciences (p. 106). Escobar (2007) equates the “ontological turn” as a

growing, and daring, attempt at looking at social theory in an altogether different way—what could broadly be termed “flat alternatives”. The language itself is indicative of this aim: flat versus hierarchical, horizontality versus verticality, self-organization versus structuration, emergence versus transcendence, attention to ontology as opposed to epistemology (p. 106).

These flat alternatives are largely derived from the notion of assemblage, and can be understood more fully by examining the new formation of global and local. Much like the re-thinking of micro and macro due to issues of scale, the ontological turn in the social sciences calls for a rethinking of the local and global binary through a flattening of ontological spaces through assemblage. As Latour (2005) states “a new topographical relationship becomes visible between the former micro and the former macro. The macro is neither ‘above’ or ‘below’ the interactions, but *added* to them as a *another* of their connections, feeding them and feeding off of them” (p. 177). This same concept applies to the global and local relationship: they are no longer nested as in the local interaction inside of a global context, but instead the effects of the global become part of the assemblage. This is what Latour (2005) means when he refers to “localizing the global and distributing the local” (p. 219) in that the global is a part of our assemblage only when it enters into associations in the network and this gesture requires that the localized translations of actants are the substance of our ANT inquiry. Connectedness defined by translation is the focus, and ANT

methodology looks to the forms of information that travel from site to site by tracing the translations of actants and resisting the urge to “*fill in the blanks*” (Latour, 2005, p. 246, italics is Latour's) with superstructures such as the global.

To summarize, thus far I have laid out three central components to ANT with the help of assemblage theory and Deleuzian ontology: 1) the symmetry of and non-humans in social ontologies, 2) the centrality of translations through association and the work of tracing network formations, and 3) the work of assemblage to maintain the complexity of contemporary sociality. To continue to map the intersections of ANT theory and theories of visuality, which is of vital importance to this research, my focus now turns to discussing foundational concepts for theories of visuality as they have been used within visual culture studies.

Re-assembling Visuality: Multiplicities of the Gaze

Thus far in the literature review there has been a focus on developing an understanding of non-humans in their relationship to conceptions of the subject, their political implications within discourses of feminist technoscience, and their importance within symmetrical relationships to humans in ANT theory through assemblage. Part of this analysis was meant as a backdrop to establishing an ontological focus over an epistemological focus, but it is also meant to establish an ANT methodology to begin assembling the social ontology of the visual technology Photoshop that is a central research participant to this study.

My focus will now turn to assembling another important body of theory within this research: *visuality*. Visual culture studies and its theories of *visuality* are not the only scholarly endeavors to focus on the visual in social and cultural contexts, and indeed collectively are not even the most natural fit for explorations in technology and the agency of visual objects (see Gell, 1998 and Pinney & Thomas, 2001 for alternatives). Certainly these areas of scholarship have merit, but there are two reasons why I am choosing to focus on visual culture studies: 1) an explicit focus on all things visual not just art, and 2) the resources for pedagogy in art education that visual culture studies and its theories of *visuality* have supplied to me and the current shift in the field of art education to a pedagogy of visual culture (Duncum, 2001, 2009; Freedman & Stuhr, 2004). For the purpose of this research, this section will begin to assemble *visuality* through visual culture studies to determine some of its translations that will then be used to assemble an inter-actor-network between visual technologies and *visuality*.

Visuality is not the only focus in visual culture studies, due to its transdisciplinary mobility across fields as diverse as film theory, art history, cultural studies, and anthropology, but it certainly is an important one (Mirzoeff, 1999; 2006; Mitchell, 2005; Sturken & Cartwright, 2009). The term *visuality* is used to reference the construction of vision as a social, cultural, and political phenomenon. As Bryson (1988) states “between the subject and the world is inserted the entire sum of discourses that make up *visuality*, the cultural construct; and makes *visuality* different than vision, the notion of unmediated

visual experience” (pp. 91-92). Therefore, visibility is more than just the things that people look at, but rather the totalizing affect of the ways that people are looking. Visibility positions seeing as a mediation of various contributors that allows the image to serve as “go-betweens or ‘sub-altern’ entities, these images are the filters through which we recognize and misrecognize other people” (Bryson, 1988, p. 351). Indeed, through this research my perception of visibility has evolved into an actor-network itself to take into account its growing complexity and make sense of it within a network framing. The disciplinary diversity of theories that visual culture studies explores through concepts of visibility certainly speaks to a network formation (Mirzoeff, 2006), and the ways that its research has created a sort of push back on the disciplines it draws from, what Mitchell (2002) calls its “dangerous supplement,” gives character to its status as an agentic actor (p. 168). From an ANT perspective, visibility would be framed as an important mediator within the field of visual culture studies for the ways that it is involved in core trajectories of inquiry within the field and placed almost continually in translation.

Prominent visual culture scholar Nicolas Mirzoeff (2006) outlines an unusual genealogy for the term visibility and its connections to visual culture studies. He begins with a common starting point for the understanding of visibility as an important theory to visual culture studies through Hal Foster’s (1988) edited collection *Vision and Visibility*. In this early text focusing on visibility, Foster creates a dialectic between vision, as the physical phenomenon, and visibility as the “social fact” (Foster, 1988, p. ix). Foster sets out the differences

between vision and visuality, but immediately acknowledges the blurring of these boundaries. Foster (1988) states:

Although vision suggests sight as a physical operation and visuality as a social fact, the two are not opposed as nature to culture: vision is social and historical too, and visuality involves the body and the psyche. Yet neither are they identical: here, the difference between the terms signals a difference within the visual—between the mechanism of sight and its historical techniques, between the datum of vision and its discursive determinations—a difference, many differences, among how we see, how we are able, allowed, or made to see, and how we see this seeing or the unseen therein.” (p. ix)

This initial position by Foster sets off a series of questions about visuality that are not easily answered through the assembled authors of *Vision and Visuality*. As Mirzoeff points out, the origin of the term itself is never really addressed either, but that may be due to its unlikely source: controversial Scottish historian Thomas Carlyle (1795-1881). Carlyle imagined the story of history as a “moral imperialism led by great men in a visual narrative” (Mirzoeff, 2006, p. 54). History is constructed through these select heroic figures, and visuality, for Carlyle, is defined as “the clear picture of history available to the hero as it happens” (Mirzoeff, 2006, p. 57). What is significant to Mirzoeff’s assertions about the origin of the term visuality is its designation as a mechanism of power over-determined by colonial aspirations. Mirzoeff describes Carlyle’s framing of visuality as a sort of clairvoyance afforded the sighted of “Anglophone imperial culture” (p. 54). This origin of the term “visuality” is presented in a tension with Foster’s (1988) sense of visuality that “sought to disrupt this homogenizing

process by discussing the physiology of vision and its psychic import, and to 'socialize this vision' and its production of subjectivity" (p. Mirzoeff, 2006, p. 55, in text citation is from Foster, 1988). This tension leads to a formulation of visuality that is targeted right at the intersection of this research in that visuality itself needs to be thought of as a network of space-time associations. For Mirzoeff, the visual subject is constituted through the "intersections between the agent of sight and discourses of visuality" (p. 76), and it is this diagrammatic posing that informs understandings of the gaze so famously drawn by Jacques Lacan (1973/1981). However, for Mirzoeff, Lacan's "geometric figure" of the gaze is displaced through the tensions of relating both senses of the term visuality (2006, p. 76). This displacement arises from the challenging genealogy of visuality that "implies an engagement with the politics of representation in transnational and transcultural form" (Mirzoeff, 2006, p. 76). Mirzoeff calls for rethinking the geometric figure of the gaze for more of a spatial relationship that he calls an "area." As Mirzoeff (2006) states:

That area is not bounded by the constant time but rather '*time as lived*, not synchronically or diachronically, but in its multiplicities and simultaneities, its presences and absences' (Mbembe, 2001: 8, original emphasis). In dealing with this complexity, 'the writing of history must implicitly assume a plurality of time existing together, a disjuncture of the present with itself' (Chakrabarty, 2000: 109). Visuality is in this sense, to use current terminology, a time-based medium. This series of connected and dispersed lines, crossing time and space, is a network. (p. 76)

This framing of the tensions of visuality within its historical use and its current determinations as a "social fact" (Foster, 1988, p. ix) calls for a movement towards a definition that exists as a folding in space-time. A vision that is layered

with histories of looking; a discourse of visibility that wears shrouds of diasporic seeing that crisscross spaces of local and global. It is a call for a visibility that is scaled through individuals and societies and flattened through a horizontality that levels cultural spaces as both unique and universal, natural and relative. This is the form of visibility that may maintain conceptual rigor within the assemblage of translations in social ontologies.

In order to continue to assemble the component parts of a visibility of this character, I must first go back to elaborate upon the “geometric figure” (Mirzoeff, 2006, p. 76) used to conceptualize the gaze that comes from psychoanalytic theory (Lacan, 1973/1981). The concept of the gaze within visual culture studies is generally the practices of looking inscribed with dynamics of desire and power relationships between those being looked at and those doing the looking (Bryson, Holly, & Moxey, 1994; Foster, 1988; Mitchell, 2005; Sturken & Cartwright, 2009; Walker & Chaplin, 1997). The gaze that is conceptualized through psychoanalytic theory relies on the resources of the subject’s unconscious to articulate a certain mutual construction of both the subject and the object that is being looked on. As Sturken & Cartwright (2009) state “not only can objects make us look, but they can also make us understand ourselves as subjects who *want* to look and who cannot help but look, even if we do not see ourselves as the one who the object hails—the one by whom the object is meant to be seen” (p. 122). This is to see visibility as a study of “spectators or audiences and their psychological and social patterns of looking” (Sturken &

Cartwright, 2009, p. 5) that necessitates framing the visual as both an individual performance and social practice.

This geometric framing of the operation of visibility suggests that the gazing individual cannot be considered whole for the psychological effects of the mutual gaze constituted by the object, and harkens back to the discussion of the decentered subject of posthuman and postmodern discourses covered earlier in this chapter. Lacan's (1973/1981) use of the term "subject" rather than an individual or person as the focus of his study was also used in early film theory in universalized claims for viewers of cinema, but feminist theories of female spectatorship have placed "the idea of the subject as an ideal rather than as a historically or socially specific being...under serious scrutiny" (Sturken & Cartwright, 2009, p. 134). This point of critique, prominently seen in Laura Mulvey's (1975/1989) essay "Visual Pleasure and Narrative Cinema," positioned the subject within a gendered power role that likened the cinematic gaze to the male gaze. Mulvey's reconstitution of the gaze as existing within gendered coding and decoding is a good example of the types of operation necessary to the movement of visibility within translation. The disembodied subject as a part of the actor-network of visibility becomes the "social stuff" that fails to render translations perceptible, and Mulvey's introduction of gender within the actor-network reconstitutes actants in translation of cinematic visioning. This re-assembling of the gaze within the translation of gender had wide ranging effects that were and are still applicable to cinema, art, and advertising, but as investigations proliferated there developed critiques of the male gaze in film

theory for the ways that it denied female pleasure and reinforced binaries of sexual difference that excluded such consideration as the lesbian gaze (Mayne, 2000; Straayer, 1996; White, 1999). In ANT terms, these movements to replace the idealized subject with one that is historically and socially constructed through relationships of gender, race, and sexuality pushed conceptions of visibility through the gaze into the realm of the actor-network within an assemblage of virtual potential. As Sturken and Cartwright (2009) state this movement of the cinematic spectator from a “regressive” subject “has been replaced by a broader set of models about the multiplicity of gazes and looks that mediate power between viewers and objects of the gaze and that are much more allied with postmodern theory” (p. 135).

The multiplicity of gazes theorized through notions of the cinematic spectator begin to constitute nodes within the actor-network of visibility, and to follow the task of assemblage by scaling up I will utilize the work of an important postmodern thinker Michel Foucault and his formulations of the institutional gaze. Foucault’s account of the gaze enriches understandings of the gaze when it suggests that the field of vision has been variously articulated at different points in history and through different institutional formations. Foucault reasoned that the subject was produced through the gaze of institutions and the relationships of power that were enacted by their discourses. These discursive formations exist “across the social formation... [as] diverse assemblages of representations, called discourses, some of which are specifically but never exclusively visual”

(Pollock, 1994, p. 14). Foucault's work demonstrates incredible breadth in investigating the assemblages of representation in discourses as diverse as law, medicine, criminality, religion, sexuality, and technology that articulate certain knowledge that is then wielded in the dynamics of social power.

A prominent discursive formation that focuses on visibility within the dynamics of social power is Foucault's (1975/1977) concept of panopticism in *Discipline and Punish*. Foucault relates a visibility of social control exercised through the penal system that transforms over time from the spectacle in public displays of criminal justice to the visual apparatus of the panopticon. Foucault examines Jeremy Bentham's architectural plans for a prison, called a panopticon, where there is a central tower encircled by a ring of prison cells where the singular guard can hear and see activity of the inmates while they cannot hear or see the guard. The panopticon as a discursive formation is meant

to induce in the inmate a state of consciousness and permanent visibility that assures the automatic functioning of power. So to arrange things that the surveillance is permanent in its effects, even if it is discontinuous in its action; that the perfection of power should tend to render its actual exercise unnecessary...in short, that the inmates should be caught up in a power situation of which they are themselves the bearer." (Foucault, 1975/1977, p. 201)

Panoptic vision is then a discipline of power whereby the control of being watched is internalized and renders visibility as a "trap" (Foucault, 1975/1977, p.200). Panoptic vision, as an assemblage, gathers criminal justice discourses, architectural buildings, and institutional organizations such as prisons.

The panoptic vision theorized by Foucault has proven to be useful in

understanding power as “not a possession but a strategy” (Lyon, 1994, p. 26) in modern disciplinary society, but in the current technological ecology certain refinements of panoptic vision have been suggested as the strategies, and assemblages, have changed. Theorist Zygmunt Bauman (2000), following Thomas Mathiesen (1997), has suggested that in a contemporary society saturated in media and screens we have moved from a panoptic visuality to a synoptic visuality where the many watch the few. Bauman states:

Spectacles take the place of surveillance without losing any of the disciplining power of their predecessor. Obedience to standards (a pliable and exquisitely adjustable obedience to eminently flexible standards, let me add) tends to be achieved nowadays through enticement and seduction rather than by coercion—and it appears in the disguise of free will, rather than revealing itself as an external force. (p. 86)

Like the panopticon, the trap of visibility becomes internalized, but instead of harboring the prison guard within this internal specter there resides a horde of paparazzi. The synopticon is a mechanism that can be understood by considering contemporary celebrity and the twenty-four-hour tabloid news cycle. In a discussion of the photo as a representation of self, jagodzinski (2008) states:

To control the technology of the image becomes a political, ethical and moral concern. And, indeed, that is the end game of today’s celebrity status in designer capitalism when it comes to the paparazzi “stealing” the celebrity’s enjoyment for the voyeurism of a larger symbolic mass public who want to “see” the celebrity star “naked”...(para 3.4)

This celebrity impulse within designer capitalism turns its own bright light on the assemblage of representation in a form of control and discipline within capitalist

society that masquerades as freedom exercised through consumption. Designer capitalism in this sense is the flexibility of global capitalism to (post)structure consumption for a radically decentered subject; the posthuman subject becomes a fluid arrangement of capital exchanges that are synoptically visualized as expressions of freedom. As Jagodzinski (2004) states, “designer capitalism has already colonized the visibility of identity politics as yet another brand to wear” (p. 8-9). This reading of designer capital becomes a synthesis of various formulations of a contemporary moment that positions an embodied visuality within a network of capitalism and technological visibility, and presents a very different social ontology than the prison houses of Bentham's panopticon.

However, as Latour (1998; 2005) has noted the panoptical apparatus, the institutionalized gaze that is derived from Foucault's panopticon, has remained “a utopia, that is, a world of nowhere to feed the double disease of total paranoia and megalomania” (Latour, 2005, p. 181). It is too totalizing for the individual interacting with screens and global media, when in fact interactions within these spaces suggest much smaller and more discrete gazes. Instead, the ANT perspective is more of an oligopticon: “sturdy but extremely narrow views of the (connected) whole are made possible—as long as connections hold” (Latour, 2005, p. 181). Getting closer to the assemblage of visuality, tracing its networked actants in space and time, may provide more powerful translations of visuality.

This visibility in capital through the network apparatus of the media and Internet presents an assemblage of visuality that is distinct from the panopticon

and synopticon in that it looks in all directions through a proliferation of screens and electronic eyes. The concept of the gaze within this actor-network of visibility should be perceived within a network which looks in all directions anytime and anywhere, but does not produce opportunities for a total vision, visibility as a social fact, but rather a social ontology that is assembled partially through visibility. It is a visibility assemblage that harbors tensions between discourses of the “modest witness,” (Haraway, 1997, p.29) simultaneously with the cyborg. This is the folding of space-time within the “area” (Mirzoeff, 2006, p. 76) of movement that is visibility re-assembled, so that formulations are not geometric, but rather immanent. It is a visibility that forms within fluid movements mobilized with a resource of virtual potential. A movement where actants, not the asymmetry of subjects, emerge as data-bodies of both flesh and bits that are in states of becoming in translation through networks of the “transnational and transcultural form” (Mirzoeff, 2006, p. 76). A re-assembled visibility within the multiplicities of the gaze that perform more like play rather than gazing, more like a network rather than a set of intersecting triangles, and more like a oligopticon than a panopticon.

So how can I get to this movement, this new area of visibility as actor-network? What “social stuff” needs to be exorcised in this movement and how, beyond Mirzoeff (2006) and his genealogy of visibility, have visual culture studies scholars suggested this movement? The next section takes up this challenge of space-time within visibility to arrive at a reckoning of an ontological framework in

visual culture studies.

Assembling (Dis)continuities Between ANT and Visual Culture

If the discourse of ANT covered so far is used as an unfamiliar starting point to a discussion of visuality, and indeed the discourses of visual culture and actor-network theory are almost perfect strangers¹⁷, then the visual becomes an actant as mediator. Michel Callon and Bruno Latour (1981) characterize actants as “any element which bends space around itself, makes other elements dependent upon itself and translates their will into a language of its own” (p. 286). The visual meets these standards: visuals certainly bend space, but I would say *in itself* in addition to around itself; other elements definitely begin to depend on it, for example the profile picture in a social network website becomes the avatar representation of the human actor within a web of interrelated uses and reliances; and finally the visual does translate its will into a language of its own which is one of the reasons that visual culture studies has evolved as a discipline. These are possible modes of translation for the visual as actant in the movement towards visuality as an actor-network. However, even if we accept this hypothesis of the visual as an actant, ANT scholars claim a radical departure from sociology, particularly from Bourdieu’s version of critical sociology (Latour, 2005), because it defines the “social not as a special domain, a specific realm, or a particular sort of thing, but only as a very peculiar movement of re-association

¹⁷ Although visual culture and ANT have very little overlapping research in print, there is some precedent for an ANT approach to a social ontology of music (see Hennion, 2003).

and reassembling” (Latour, 2005, p. 7), and to set this method within visual culture studies is to discern the peculiar movement of “culture.” ANT introduces the thing (object) as an actant in the network as a gathering of agencies that could coexist with equal symmetry to human mediators, but culture is not a thing and needs to be more carefully understood within this actor-network structure for the ways that it relates as the social stuff mobilized for constructing a visual culture.

As a prominent ANT scholar and theorist, and indeed an important voice in this study, Bruno Latour’s work rarely engages with the concept of visual culture, and yet we find him using the term in his discussion of images and scientific progress (Latour, 1990). Core to his argument is that the image has played a key role in blocking dissent from scientific discovery due to its mobility and immutability. His discussion of scientific visual culture, that of graphs and diagrams, constructs a snowball effect of a scientific visioning that concretizes scientific objects of study, silences dissent through repetition, and harkens allies in the building of scientific theory. For Latour, it is not so much the efficacy, objectivity, or truth of the scientific fact that has accelerated the rule of scientific reason, but the image that has accelerated scientific discovery.

Significant to Latour’s discussion, is within the first few pages of the article where he outlines a presupposition to his discussion of the acceleration of scientific discovery: “no ‘new man’ suddenly emerged sometime in the sixteenth century, and there are no mutants with larger brains working inside modern

laboratories who can think differently from the rest of us” (Latour, 1990, p. 19). With this presupposition in order, then it is the smaller possibilities that might allow an analysis of this acceleration that evades metanarratives of human progress. If we take this position within the field of visual culture, then the question becomes is there an acceleration in visualizing or the presence of the visual in contemporary society that might account for the emergence of visual culture studies?

The assertion of the visual as a dominant mode of representation in contemporary society is a common presupposition for the need for visual culture studies. Marita Sturken and Lisa Cartwright (2009) begin *Practices of Looking: An Introduction to Visual Culture* with “we are thus at a moment in history in which the visual matters more than ever” (p. 1). Nicolas Mirzoeff (1999) in his *An Introduction to Visual Culture*, states “human experience is now more visual and visualized than ever before from the satellite picture to medical images of the interior of the human body” (p.1). Martin Jay (1993) has discussed the centrality of vision in contemporary Western society in his use of the term ocularcentrism. However, there is a proportionate backlash to this assertion, because the claims to a particularly severe ocularcentrism to contemporary Western culture have been countered for ahistoricism, ethnocentrism, and its possible teleological assumptions of the sensory capacity of vision ascending to prominence in contemporary society (Brennan & Jay, 1996; Hamburger, 1997; Pinney & Peterson, 2003; Shohat & Stam, 1998).

These antagonisms to the ascension of the visual sense combat an assertion of visualization, its prominence due to the rapid development of screen

technologies in recent history, equated to a visually dominant culture when the issue is more a technological one. To conflate the technologies of visualization with “our” culture being more “visual” overlooks two important points to the mediascape of contemporary society. First, the visual is always multisensory (Cubitt, 2002; Mitchell, 2002; Sturken & Cartwright, 2009). Second, the assertion equates a certain role to visual apparatus within a teleological assumption of progress, in that the rise of the visual is a result of technological advances related to the acceleration of a technoscientific epistemology pervading ideologies of late capitalism. The implications of these two assumptions inscribe visual culture studies within a historical before and after, as in once there was but now there is, in a fashion that is highly anecdotal. The problem with these assertions is that they inherently position an “us” in visual culture and a “them,” most certainly historically if not also inside the Western world and outside of it. Are visual culture studies primarily a sociology of technoscientific visualization? The proliferation of visual technologies certainly warrant attention, but what outside of the ascension of the visual sense might explain the “pictorial turn” (Brennan & Jay, 1996; Mitchell, 1995)?

W. J. T. Mitchell (2002) in “Showing Seeing: A Critique of Visual Culture” presents a number of “fallacies” that surround the emergence of visual culture studies, the predominance of vision in contemporary society being but one of them. For Mitchell, the presupposition that provides the genesis for an academic outgrowth in visual cultural studies begins with the disruption of what Norman

Bryson (1983) called the “natural attitude” in that images are taken as surfaces of universal messages whereby a natural interpretation becomes apparent to all who look on. Instead, the image is a semiotic terrain of meanings that are “an arena for political and ethical critique” (Mitchell, 2002, p. 171). However, Mitchell extends this genesis of visual culture studies from the disruption of the “natural fallacy” to promote a dialectical tension for visual culture studies that entails mapping the terrains of semiotic coding, as a linguistic model, and navigating the excess of visual representation that is beyond language. Mitchell states, “To what extent is vision *unlike* language, working...like a message without a code?” (p. 171). In this dialectical tension, Mitchell manages to escape visual teleology, in that visual culture studies is a project of investigating the tensions inherent in the social construction of semiotic meaning(s), and one of understanding the visual as an excess of language, impossibly outside of language and representation. This tension, as opposed to assertions of vision as *the* sense in contemporary society or somehow more prominent than in previous societies or geographies, “cannot rest content with a definition of its object as the ‘social construction of the visual field,’ but must insist on exploring the chiasmic reversal of this proposition, *the visual construction of the social field*” (Mitchell, 2002, p. 171, italics are Mitchell's).

Understanding visuality as an investigation of the social construction of the visual does present some antithetical positioning for ANT scholarship, but Mitchell presents an opportunity for generating connections. In his chiasm, Mitchell positions the visual in the mode of the actant, as a mediator in the social ontology that does not presuppose a social but instead constitutes it. He states, “this

approach would treat visual culture and visual images as go-betweens in social transactions, as a repertoire of screen images or templates that structure our encounters with other human beings” (Mitchell, 2002, p. 175). The ways that visual culture studies may extend analysis of the actant multiplicity of the visual provides a connection to ANT and its sociology of associations, so that there appears to be fertile ground between these two discourses.

Additionally, Mitchell (2002) asserts that visual culture goes beyond disciplines of art history and media studies into investigations of “vernacular visuality or everyday seeing” and “looks at the strange things we do while looking, gazing, showing and showing off such as hiding, dissembling, and refusing to look” (p. 179). The focus on vernacular visuality provides robust translations between mediators that are assembled through an ANT sociology looking oligoptically: seeing through “narrow views” (Latour, 2005, p. 1981) the everyday moments that are in connection momentarily, and begin to set up further potential for these two discourses to synthesize in ways that can contribute to an understanding of visuality in a social ontology. This visual construction within “everyday seeing” (Mitchell, 2002, p. 179) is an important component of understanding an ontological framework of visual culture studies. However, it fails to address how to move beyond the first portion that focuses on the “social construction” of the visual. To understand how social construction is deployed in visual culture studies it is necessary to look to the term “culture” and its import to the discipline. As Nicolas Mirzoeff (1999) states: “visual culture has

to proceed by defining both the genealogy of the visual that it seeks to use and its interpretation of the loaded term ‘culture’” (p. 13).

The social construction of the visual can be broken down into two threads of inheritance in visual culture studies in regard to its use of the term “culture.” From the outset, the distinctions between definitions of culture should be seen as amorphous at best, in that culture and its definitions take on many expressions. Core to the assumption of this two-part division is the necessity of laying a foundation to the components to social construction, through the ways that these two components have taken up the visual within different arenas of the visual. From the cultural standpoint of the social construction of the visual, visual culture studies has sprung from such academic traditions as art history and film studies, in that it has engaged a cultural framework through the arts from which to approach its object of study. Nicolas Mirzoeff (1999) positions this first part of the culture definition from the prominent work of 19th century scholar Matthew Arnold, specifically *Culture and Anarchy* published in 1869, that continues to define the use of the term culture in current scholarship. According to Mirzoeff, Arnold’s definition of culture placed a condition of supremacy on culture that set up lasting dynamics of high and low culture and related culture as the product of the elite. In contrast to this definition, there is a second component to the definition that comes from anthropologist E. B Tylor’s *Primitive Culture* published in 1871. Tylor’s definition positions culture as a network of social relations that help define a particular subject as being from one culture or another. It is noted by Mirzoeff (1999) that these definitions bring with them a heavily colonial orientation that asserts white, Western supremacy that cannot be overlooked on the part of visual

culture scholars, and must be combated by “moving beyond ...essentialism towards an understanding of the plural realities that coexist and are in conflict with each other both in the present and in the past” (pp. 24-25).

Sturken and Cartwright (2009) set up a similar foundation in their analysis of the definition of culture, and, following cultural studies scholar Stuart C. Hall and theorist Raymond Williams, set out the caveat that culture goes beyond objects as more “a set of processes or practices through which individuals and groups come to make sense of things” (p. 3). With the inheritance of these definitions of culture helping to construct the framework of how the term culture is used within visual culture studies, the assumptions of visual culture studies focuses on those processes of cultural meaning making that arise from visual experiences. For some, this implies an emphasis on visibility over vision as its object of study when visibility is used to reference the construction of vision as a “cultural construct” (Bryson, 1988, p. 91). And although Hal Foster (1988) chooses not to bifurcate the relational tension between vision and visibility, he nonetheless asserts the cultural framework of an entangled vision and visibility. Foster (1988) asserts the anthropological concept when suggesting visual culture studies be involved with studying “a difference, many differences, among how we see, how we are able, allowed, or made to see, and how we see this seeing or the unseen therein” (p. ix). Therefore, the phenomenon of vision as a visual experience maintains its status as part of the object of study, but it appears to only within a cultural framework.

However, Martin Jay (2002) has questioned the assertion of the cultural framework when asking “is the visual no longer separable from visibility... is it culturally coded all the way down, with no excess beyond what the cultural mediation itself dictates?” (p. 271). Jay’s line of questioning is ultimately pointing towards the complicity of visual culture studies to work vision within the cultural framework while inscribing the visual experience within discourses of cultural relativism. As a methodological and heuristic device of anthropological research, partly in reaction to the ethnocentric naturalism of the Enlightenment, cultural relativism was an application of the unique context of cultures and their actors. It applied an epistemological veneer to human relations and society that engendered locality with supremacy and relegated universalist claims to human relation as untenable. As Jay (2002) states, “however large the unit deemed a discrete culture, the argument remains that no transcendental standpoint, no umbrella identity, no deeper essential human nature, can trump its mediating power” (p. 271). Although cultural relativism was used in the social sciences to strategically undermine an imperial anthropology in its infancy in the late 19th century, cultural relativism in extreme levels all possibility of knowledge across cultures or universal values such as human rights (Pollis, 1996). As sociologist Raymond Bourdon (2003) states of the “hyperbolic” adoption of cultural relativism “*a priori* assumptions are built notably on a misuse of the principle of the no middle term” (p. 438). According to Bourdon the “no middle term” principle, attributed to Clifford Geertz (1984), is inflexible to the in-between state of understanding the socialization of cultural conventions alongside those based on rationality or simply outside of convention.

My point here is not to raise the suspicion of truth or resurrect a universal rational mind, but rather to dwell precisely in the tensions of the in-between space, or the middle term, as a productive argument for visual culture studies. As stated previously, the need for visual culture studies does not arise from some anointed position of vision and visibility in the evolution of the senses within Western society. Rather, as I have reasoned, this is a position in history characterized most notably by its technoscientific proliferation of a networked visual apparatus, filling the lists of my possible actant participants in this research, and not an ascension to history for the visual. Instead, the dynamic of visual culture studies that I am most interested in pursuing is endeavoring research in the excess of the visual beyond language along with its determinations in discursive formations within social ontologies. Part of the productive tension of the middle term is to work backwards from the arguments over cultural relativism, and look to the term culture itself as problematic or possibly inadequate for visual culture studies. For ANT scholarship this would be the position where we remove the *a priori* assumption of Culture, through both its classist determinations and its filler effects as the social stuff peculiar to visual experience, to then re-assemble the actor-network of the visual to arrive at culture: culture does not exist until it is assembled through vision and visibility.

What is visual culture's middle term? Or, what are the *a priori assumptions* of Culture, evidenced in the debate of cultural relativism, and how might revising the cultural framework of visual culture studies proceed? I will look

to Bruno Latour again to chart part of this black box of culture to illuminate part of its contingency and inadequacy for visual culture studies. Latour's (1991/1993) *We Have Never Been Modern* is an attempt to topple the monist opposition of culture and nature that is paramount to what it is to be modern. According to Latour, the modernist's divide of culture, the relations of humans, and nature, the relations of non-humans, is an opposition built on purification. Built within the trajectories of the scientific laboratory (biology, chemistry, physics) and the social sciences (sociology, anthropology), these epistemologies of modernism artificially divide human and non-human collectives while coexisting with a proliferation of hybrids.

A contemporary example of this purification versus translation, i.e. the praxis of hybrids, is the current debate surrounding global warming. Conducting an Internet search surrounding the topic entails negotiating between the proliferation of scientific facts, geopolitical arguments, and ecological spiritualism that swirl in an entangled assemblage. The hybridity of the global warming phenomenon cannot be disentangled from its ontology of both human and non-human factors, yet the very persistence of this hybridity re-inscribes the modernist stance for further purification. The debate does not find further clarity through further facts, because these scientific "facts" proliferate on both sides of the debate concerning the correlation between the burning of fossil fuels and global warming. The hybrid assemblage is the constitution of the global warming issue, yet it is the reinvigorated methods of purity that are pursued to settle the matter and clean up the mess of uncertainty. As Latour (1991/1993) states, *"the modern Constitution allows the expanded proliferation of the hybrids whose*

existence, whose very possibility, it denies" (p. 34, italics is Latour's).

This inherent contradiction to the modern critical stance is the basis for Latour's claim that *we have never been modern*. The division of nature and culture has never been outside of the proliferation of hybrids. Instead,

we now find ourselves confronting productions of natures-cultures that I am calling collectives—as different, it should be recalled, from the society construed by sociologists—men-among-themselves—as they are from the Nature imagined by epistemologists—things-in-themselves" (Latour, 1991/1993, p. 107).

The modernist distinction then of the subject of society and the object of science breaks down into a networked quasi-object and quasi-subject that can only be collected within natures-cultures.

As the production of nature-cultures proliferate, both into the future and as a reassessment of the inheritance of modernism, there arises a nonmodern epistemology that reorients the framework of culture itself. According to Latour (1991/1993), "*the very notion of culture is an artifact created by bracketing Nature off*" and by this effect cultural relativism is ascribed a fluidity that Nature is not (p. 104, italics are Latour's). The effect is one of a scientific rationality that is universalized while culture is relative, but in the epistemology of nature-cultures there also exists a relativism of nature in that it does not exist partitioned from culture. For Latour this returns a symmetry to anthropology, and the social sciences at large, which complicates the purification of scientific facts while not denying them; simultaneously it balances a radical cultural relativism through the non-human components of the social world.

What this shift to nature-cultures provides to visual culture studies is a facility to see the visual in both its discursive and cultural implications, but also in its excess of it. As Martin Jay (2002) states the

notion of hybridity is the impossibility of reducing figurality entirely to discursivity, image entirely to texts, the visual to nothing but an effect of the same codes that underlie the linguistic. That is, it is as impossible to reduce natural visual experience to its cultural mediations as it is to disentangle it entirely from them. (p. 274)

Being nonmodern might bring back the force of vision and visuality of visual nature-cultures, and plot trajectories for a visual culture studies scholarship that assembles the excesses of graphicality beyond linguistic determinations of semiotics or the teleology of technoscientific evolution of the screen.

One notable hybrid is Mirzoeff's (1999) formulation of the "transcultural." With the inheritance of an anthropological definition of culture within visual culture studies that has positioned a Western and non-Western bifurcation, with an implied modern and premodern association, Mirzoeff looks to dismantling this inheritance as an important contribution by the field of visual culture studies. Mirzoeff (1999) states "transculture offers a way to analyze the hybrid, hyphenated, syncretic global diaspora in which we live" (p. 131). He continues,

by consistently exposing that history and asking how the visualism of the present can be distinguished from the past, visual culture can play its part in redefining culture as a constantly changing, permeable and forward-looking experience of transculture, rather than as a clearly defined inheritance from the past. (p. 132)

His efforts here in the articulation of "transculture" are a return to his notion of a movement to visuality as an "area" of space-time, and it is the discourse surrounding diaspora which he analyzes for its folding of history. Mirzoeff

(2000/2006) furthers his exploration of transculture in his edited collection of essays titled *Diaspora and Visual Culture: Representing Africans and Jews* in highlighting the “intervisuality” of a blending between diasporas and intertextuality: the flow of cultures beyond nation states that is characteristic of diasporas require that visual culture evolve beyond an analysis of “interlocking texts” to “interacting and interdependent modes of visibility” (p. 97). Intervisuality becomes a part of a larger postcolonial scholarship that has taken up hybridity as a way out of the colonialism of the past and into possibilities of the future from multiple viewpoints. However, Mirzoeff (2000/2006) acknowledges the difficulty in forging a visual culture of the future “when all that is available is the discredited apparatus of the modern?” (p. 97). His suggestion is in “writing diasporist genealogies of the present that reconfigure the past in order to facilitate the theoretical and phenomenological understanding of the multiple viewpoint of diaspora.” Although diasporas may seem like a strange place to search for nature-culture hybrids for an ANT methodology, I see Mirzoeff’s use of the transcultural and intervisuality as instructive in two ways for my analysis of an actor-network of visibility. First, diaspora makes culture itself hybrid as a series of flows and (dis)continuities that constitutes cultural movement in geographies (spaces) and histories (folding time). Second, diaspora is an important example of flowing mediators of visibility in that the concept of “intervisuality” relies on the ANT notion of translation for the inter-actor-network associations that make durable connections between and among diasporic hybrid cultures. Like

Mitchell's (2002) concept of the visual construction of the social in vernacular
visuality, Mirzoeff's notions of transculture and intervisuality are offered here as
examples of what I see as the beginning of a movement towards a social
ontology of visuality.

The analysis above offers some existing overlap in visual culture studies
and ANT, but this is only possible when visual culture studies goes beyond
culture. If visual culture studies stay in a natureless determination of culture,
where the oscillating argument of relativism goes around and around, the
monism of Western definitions of Nature, through its sciences, continues to elude
the postcolonialist revision of culture. Cultural relativism becomes a flexible
appendage to a determinist Nature; there is one Nature, the collectives of non-
humans, and many cultures, the collectives of humans. The project is
unbalanced; diasporas rely on the hybridity of all things, nature and culture, and
vernacular modes of visuality sustain an oligoptic narrowing of the visual field to
locate tracings in the social ontology. Like assemblages related through scale, a
movement towards a flattened visuality within a social ontology gathers localized
globals networked through intervisualities, folds time as a revisionist history of
present-futures, requires the force of vision and visuality through the hybrids of
nature-cultures, and maintains a symmetry of actants through a visual
construction of the social-cultural.

The very centrality of the exploration of the term "culture" exemplifies the
double movement that is characteristic of visual culture studies. On the one hand,
visual culture studies has been thought of as a loosely connected discipline that
is framed through its own inheritances and traces of former disciplines (Mirzoeff,

1999; Sturken & Cartwright, 2009). On the other, visual culture studies has been framed as a supplement to a range of disciplines in the midst of a “pictorial turn” (Brennan & Jay, 1996; Mitchell, 1995). In some cases these delineations reflect methodological particularities that fill the toolbox of visual culture studies, such as Gillian Rose’s (2007) *Visual Methodologies: An Introduction to the Interpretation of Visual Materials*, in its interdisciplinary pursuits of presenting methodologies of qualitative research that use visuals and visual experiences. Certainly, these delineations also reflect the bristling of academic territoriality from the “dangerous supplement” (Mitchell, 2002) of visual culture studies. This search for academic territory is a constant arch in the development of visual culture studies institutionalization, most notably bubbling over in the now infamous “Questionnaire on Visual Culture” printed in the art criticism journal *October* in 1996. My interests are not in staking out territories of purification, but rather locating the hybrids of visual nature-cultures by analyzing the inter-actor-network connections of visibility and the visual technology Photoshop. My efforts to double back the viral effects of the “pictorial turn” onto media studies is not a new endeavor, because as I have outlined there have been many connections made between the advances of visual technologies and visual culture. However, I am offering a distinct approach through ANT that constructs an ontological methodology that re-frames certain scholarship already offered in visual culture studies, as evidenced by Mirzoeff’s (2000/2006) *Intervisuality* and Mitchell’s (2002) *Iconology*, but that also offers its own particular movements for

visuality in a social ontology.

The concluding section that follows is a return to the heuristic devices established in the introduction chapter: technological ecology, digital chimera, and network being. At this point I would like to offer further characterization of these devices by reviewing the literature concerning these terms, so that they are re-conceptualized as movements that will be used to facilitate my analysis of the social ontology of visuality and the visual technology Photoshop. These three movements are offered in preparation for the methodology and data analysis sections that follow this chapter.

Movement 1: On Technological Ecologies

Part of the movement of the technological ecology is centered on the use of ecology as a framing mechanism to efface the logic of the paradigmatic shift (Kuhn, 1962). Instead of the replacement rhetoric of paradigms, ecology is used as a state that arranges resources in ways that are not always logical, rational, or promoted within a frame of progress. As a branch of biology that studies the relationships between organisms and their environments, ecology “is essentially a science of relationships, i.e., of the interdependence of various factors in a dynamic system” (Wojciechowski, 2001, p.1). Outside of biology, ecology has been deployed as a movement to reconceptualize many disciplines: in areas of linguistics (Haugen, 1972/2001), to better understand the mind through the interrelationships of ideas and learning (Bateson, 1972), to examine formations of knowledge (Wojciechowski, 2001), to understand political power relationships

(Wolf, 1972), and to understand human relationships within cultural anthropology (Sutton & Anderson, 2010). Ecologies do not replace one another, as paradigms suggest, but instead grow out of and into one from another, which may lead to trajectories but resist overt narratives of evolution or replacement.

An ecology movement would be wary of framing technology as ahistorical or attributing a monism to what it can or cannot be. In what Errki Huhtamo (1999) calls the technorationalist approach, this ahistorical framing of innovative technologies “does not suffice to give a full account of the ways in which technology is woven into the fabric of culture” (p. 97). Instead, taking into consideration the cultural perceptions of technologies and their evolution is considered part of the ecological condition, and has been formulated through scholarship dedicated to building an understanding of technology through its historical and social dynamics (Ascott, 2003; Bell & Kennedy, 2000; Briggs & Burke, 2005; Lunenfeld, 2000; Trend, 2001; Winston, 1998; Zielinski, 2008).

Within an ecological movement, it is also possible to conceptualize how these communication technologies have continued to co-exist: broadcast radio stations exist right alongside online radio stations alongside satellite radio alongside amateur radio. Simultaneous to co-existence, in many cases you have a blending of technology forms whereby media types no longer take on separate entities, and control of media production is distributed among individual and corporate media players in a “convergence culture” (Jenkins, 2006). As Henry Jenkins (2006) states, convergence culture is “where old and new media collide,

where grassroots and corporate media intersect, where the power of the media producer and the power of media consumer interact in unpredictable ways” (p. 2). The convergence culture that Jenkins’ analysis forefronts seems to indicate a focus on a media ecology, and indeed the term has been used to conceptualize digital media practices (Ito et al., 2010). However, the term “media” itself is constantly shifting in the ways that it can reference a platform (social media), a product (multimedia), or an industry (“the media”) and renders it unwieldy for this study. In addition, a media ecology forefronts what is produced over the medium itself (such as a computer), and this study attempts to understand visual technologies and visuality which includes a consideration for its materiality as a technology. In this respect, for this study the constitution of a technological ecology is meant to take into consideration both the media, as in the output of production, and its medium as in the software and hardware of visual technologies like Photoshop.

The term ecology in reference to visual technologies is useful as well in its correlation to networks as organic structures that expand and contract as resources and actants contribute and shape its formation. In DeVoss et al.’s (2009) introduction to *Technological Ecologies and Sustainability*, the technological ecology is used as a term to express the interconnected roles that computing environments, users, and institutional structures play in the design and implementation of technology resources in higher education writing programs. Ecology is used in this context to not only to frame the many factors involved in the use of technology in these spaces, but also to inflect the issue of sustainability to the ongoing role of technology in learning. Importantly, the

authors invoke sustainability to “beg the related questions about what we are sustaining and for whom?” in order to implement a reflexive feedback loop in technological learning situated within realms of “humanistic and educational goals” that downplay an overt methodology of efficiency” (DeVoss et al., 2009, pp. 8-9). Within the frame of a technological ecology, exploring the social ontology of the visual technology Photoshop is not expressly to use new technological tools, singularly promote 21st century digital skill building, or promote cybernetic communities, but rather to review these within the ecology of non-technological visualities, non-digital visual technologies, and the continued relevance of network ontologies of offline sociality. Technological ecologies also pay particular attention to the material environments of computer labs, network systems, and administrative orchestration of using visual technologies as they intertwine with other ecologies such as the “learning ecology” (Barron, 2004). The use of the technological ecology in this research as a movement for analysis will focus on the mobilization of resources within the social ontology of the visual technology Photoshop and direct inquiry as to the question of sustainability.

Movement 2: On Digital Chimeras

The movement of the digital chimera addresses the formations of the actants themselves. The technological ecology is filled with digital chimeras as data-bodies that exhibit the folded histories of a flattened visuality much the same as Hayles’ (1999) use of the idea of “seriation” patterns (p. 14). Seriation, a

term appropriated from archaeological anthropology, highlights the overlapping of concept and material form of actants as attributes change through time. In conjunction with the patterns of seriation is the physical manifestation of skeumorphs that populate within the technological ecology. A skeumorph is “a design feature that is no longer functional in itself but that refers back to a feature that was functional at an earlier time” (Hayles, 1999, p. 17). An example of a skeumorph would be the inclusion of the “dodge” tool in Photoshop that is used to make digital pixels lighter. Dodging is a development technique in photochemical processing where light is obstructed from the light-sensitized surface of photo printing paper to make areas of the image underdeveloped and hence lighter in tone. My example of the dodge tool as a skeumorph is used to highlight the bridge of understanding what the tool does, but does not transfer the actual functioning of the tools: lightening pixels has almost no relationship to lightening areas of light sensitive chemicals besides its effects. When considering communication technologies through the 20th and 21st century, it is important to see the inheritances that flow from radio to cinema to television to the Internet, and this is also a part of the movement of the digital chimera.

Another important aspect to this movement is its relationship to the virtual. In this literature review I have outlined two distinct concepts of the virtual:

1. “Virtuality is the cultural perception that material objects are interpenetrated by information patterns” (Hayles, 1999, p. 13-14).
2. Virtuality is a dimension in a complex system that harnesses the multiplicity of potential and “actualization of the virtual in space and time entails the transformation of intensive differences into extensive (readily

visible) forms through historical processes involving interacting parts and emerging wholes” (Escobar, 2007, p. 107).

Movement through the digital chimera allows for both concepts of the virtual: an emerging formation that is always already material and data interpenetrated, and a multiplicity that is ever present but different from the actual formation that is molded through space and time. The movement of the digital chimera is one of “remediation” (p. 44). As Bolter and Grusin (2000) state:

Digital media cannot be significant until they make a radical break with the past. However, like their precursors, digital media can never reach this state of transcendence, but will instead function in a constant [network] with earlier media, precisely as each earlier media functioned when it was introduced. Once again, what is new about digital media lies in their particular strategies for remediating television, film, photography, and painting. Repurposing as remediation is both what is “unique to digital worlds” and what denies the possibility of that uniqueness. (p.50, inclusion in the brackets is my addition)

The movement of the digital chimera will be used to analyze the data-bodies that compose human-technological collaborations and populate the technological ecology. It will also maintain focus on the inheritance of historical trajectories in innovation to study the skeumorphs of visuality and highlight the immanent possibility of the virtual.

Movement 3: On Network Being

The movement of network being is perhaps the most significant in this literature review. The term “network,” in its use in the phrase network being, is a

clear reference to the assembling of actor-networks so central to an ANT methodology. However, the notion of the network also inflects the decentered infrastructure that guides computer networking as its most visible iteration of the network structure (Barabási, 2003) even though the networks referenced by ANT are explicitly not to be conflated as the same thing as this technological infrastructure. (Latour, 1999; 2005). Considering my endeavor to implement movements through the technological ecology and of digital chimeras, the ontologies of technological networks in digital computing are of central interest. Therefore, in my use of the movement of network being, there is an explicit connection between my use of ANT's methodology of assembling actor-networks and networked computing.

In addition, I will utilize more than an ANT sense of network in my formation of a network being by accessing other movements of networks within disciplines such as mathematics. Networks, as derived from mathematical concepts, stem from the field of graph theory, and have led to the development of complex data tools to assist in network analysis and visualization (Newman, Barabási, & Watts, 2006; Quandt, 2008). In the second half of the 20th century, graph theory was taken up by social scientists to help analyze data from ethnographic studies (Wasserman & Faust, 1994). More recently, the work of physicist Albert-László Barabási (2003) has demonstrated that an understanding of networks as decentered is only partially accurate and that a clearer articulation of certain formations may be in the form of the scale-free network. The topological characteristics of a scale-free model indicate that network formation is based on growth and preferential attachment with the underlying principle being that nodes

in the network that have more nodes attached tend to be preferred. This topology has been demonstrated in analysis of network formations as diverse as genetic coupling, growth of the World Wide Web, and the spread of AIDS (Barabási, 2003). The concept of scale-free networks reintroduces the power relationships that appear to have been evacuated in the analysis when the “social stuff” was removed with ANT. This is an ontological strategy that reintroduces power dynamics into flattened topologies especially when considering scaling up in assembling.

However, the movement of a network being in this research is taken from ANT, and the other philosophies and social ontologies mentioned, in the forms outlined above through actants, translations, and assemblages. ANT supplies an expanded definition of network more possible to a network being, because of the contribution that actants make to understanding the component parts to assemblages within social ontologies. A network being is an assembling of actants as mediators that are without unity, and therefore ontology itself is without cohesion, because the thing itself is a gathering of agencies.

Latour (2005) structures this ontology without unity in his discussion of matters of fact versus matters of concern. Matters of fact are characterized by the rigor of scientific fact: an object or hypothesis has been tested and supported through further tests. A matter of fact is a closing down of investigation, a singularity, and an empirical certainty. However, ANT has demonstrated that empiricism is not so certain; objects and matters of fact become more complicated the closer you get to them so that “the empirical multiplicity of former

'natural' agencies overflows the narrow boundary of matters of fact" (Latour, 2005, p.111). Objects cannot be reduced to facts, but instead are multiplied as matters of concern. For Latour, matters of concern "while highly uncertain and loudly disputed, these real, objective, *atypical* and above all, *interesting* agencies are taken not exactly as object but rather as *gathering*" (p. 114). To see an object as a matter of concern is to see objectivity multiplied and this returns to network being: an assembling of actants as mediators that are without unity. It is paramount to this study that the visual technology Photoshop is articulated as a matter of concern within the movement of the network being, and that through these new assemblages visual nature-cultures may be perceived.

Chapter 3: Methodology

Introduction

This section outlines what sites, methods, and data analysis are involved in my assembling the social ontology of visuality and the visual technology Photoshop. The visual is positioned as a matter of concern for the “real, objective, *atypical* and above all, *interesting* agencies” (Latour, 2005, p. 114) that it brings to the assemblage of visual culture, and my investigation of the social ontology of the visual technology Photoshop is an effort to explore the symmetry of actants that may better articulate a network area of visuality (Mirzoeff, 2006).

It is the intent of this methodology to trace the translations between Photoshop and myself so that an ontological framework of visual culture studies may be enunciated through this gathering. Part of this enunciation will be through three movements, outlined in the literature review as the technological ecology, digital chimera, and network being, that will facilitate my assembling of the inter-actor-network formations of visuality and the visual technology Photoshop. The symmetry between humans and non-humans is one of the central components of

ANT, and therefore I will begin the methodology by positioning myself in the research as the instrument of research and then as a participant before I move on to my central actant collaborator Photoshop.

Positioning Myself as Research Instrument

In order to position myself as an instrument of research and participant, John W. Creswell (2009) suggests that qualitative researchers should “make explicit the philosophical ideas they espouse” by acknowledging their worldview (p. 5). A worldview in this context is used to reference the “basic set of beliefs that guide action” (Guba, 1990, p. 17), and is a similar concept to theoretical paradigms or frameworks (Stinson, 2009). There has been a noted proliferation of these paradigms in qualitative research due to the crisis in representation present in postmodern and poststructural theories (Lather, 2006), and determining a satisfying worldview through the paradigms can require “eclecticism as a solution” (Stinson, 2009, p. 498).

My particular eclecticism draws from qualitative research within the “post-theory” paradigms (McQuillan, Macdonald, Purves, & Thompson, 1999) that continually problematize constructions of the subject, and explore contingency through the social ontologies that are the focus of an ANT methodology. It is a basic belief to represent research that is situated as always already reductions in (re)presentation. Researchers, subjects, and constructions of knowledge are all seen as partial and contingent, so that agency is “up for grabs, continually reconfigured and renamed as is the subject itself” (St. Pierre, 2000, p. 504). ANT

takes many of these assumptions of post-theory as a part of its methodology in that there is an emphasis on contingency that relies on the work of assembling “messy” actor-networks (Law, 2004b).

However, this reliance on contingency and assembly have not always driven my work with students in learning spaces. For the past decade, I have been working as a teacher using digital technologies in art classrooms in both school and museum spaces, and early on in this work my focus was more on what I will call an emancipatory media pedagogy. There has been much scholarship surrounding the ever-changing relationship between digital technologies and education, but this approach has two central threads that have influenced my pedagogy. In my experience, the emancipatory media pedagogy discussion, discursively framed within a new literacy or otherwise (Buckingham, 2003; Gee, 2003; Jenkins et al., 2006; Kubey, 1997; Luke, 2000), has focused on two frameworks: the first framework focuses on the user’s performance on media technologies, and the second framework focuses on the performance of media technologies on the user. One perspective has been to view both performances within an ethic of democracy or as a part of a “global civil society” (Delacruz, 2009) where media consumers and producers negotiate media strategically as a commitment to citizenship (Howard, 2006; Papacharissi, 2002; Zukin, 2006). Other perspectives on these media performances use a critical theory paradigm (Guba & Lincoln, 1994) to focus on the ways that media and its technologies perform on users to re-inscribe through ideology inequitable

structures in society through media consumption (Kellner & Share, 2005; Macedo & Steinberg, 2007). This perspective ranges from work that focuses on an effort to raise consciousness through neo-Marxist methods of deconstructing the reading of media texts with a critical semiotics (Jacobs, 2005) to “a more collaborative approach to critical inquiry...to empower” (Lather, 1986, p. 272) media users as media makers (Goodman, 2003).

This perspective in participatory research, especially under “emancipatory theory” (Lather, 1986, p. 272) perspectives, has characterized my approach to teaching media up to this point. However, conflicts within the notion of emancipation and its inevitable contradiction within the power dynamics of teaching and schools become hard to overlook. Essentially, emancipating as a media pedagogy for me meant delivering what media is and how to take control of it, and over time re-inscribed power dynamics of teacher and learner that were not emancipatory. Instead, the focus in this research is slightly outside of these frameworks of a emancipatory media pedagogy, and instead looks more closely at the social ontology of the visual technology Photoshop to better understand my collaboration with visual technologies. In other words, the framework for this research takes into consideration how new media *performs with us and not on us or us on it*. This focus invites the symmetry between actants, human and non-human, within this research, and utilizes a theoretical analysis that draws from posthuman subjectivities, theories of visuality, and assembling social ontologies drawn from ANT as was outlined in the literature review section.

My post-theory jumble, attempting to move beyond contradictions of emancipatory paradigms, requires a shift in research paradigms that has been

characterized as deconstructive alluding to Derrida's (1976) concept. As Jill Green and Susan Stinson (1999) state "deconstructivist research is not really a method but more a way of thinking...that reflects postmodern thought," and "embraces a multiplicity of knowing that is contingent, polyvocal, and subjective" (p. 109). While my methodological approach definitely emphasizes contingency, the post-theory methodology that I have adopted through ANT shifts slightly from a deconstructive framework in the way that it focuses on ontology instead of epistemology. An ANT methodology applies the same sense of multiplicity only to illuminate the heterogeneity of objects and the contingency of social ontologies becoming in the material world.

This generative open-endedness will rely on what Patti Lather (2007) calls a "rhizomatic validity" (p. 124). Drawing on the metaphor of the rhizome from Gilles Deleuze and Felix Guattari (1983; 1980/1987), Lather characterizes rhizomatic validity as

Rather than a linear progress, rhizomatics is a journey along intersections, nodes, and regionalizations through a multicentered complexity. As a metaphor, rhizomes work against the constraints of authority, regularity, and commonsense and open thought up to the creative constructions that arise out of social practices, creativity which marks the ability to transform, to break down present practices in favor of future ones." (p. 124)

Therefore, validity for this research focuses on whether the actor-networks that are assembled are sufficiently complex. Validity checks will maintain a narrow view to support the oligoptic apparatus of ANT (Latour, 2005). Validity in an ANT methodology has many commitments: to stay close to the associations, to follow

the traces of important translations, to maintain focus on mediators, to resist black boxes, and to clamp down on a flattened topology characteristic of social ontology (DeLanda, 2006; Latour, 2005; Law, 1999). My problematic is researching a non-human actant, Photoshop, in performance with me. In order to observe this social practice I need to maintain focus on the generative complexity of Photoshop, through more than its instrumentality, by *seeing it working with me* in the production of digital visual culture.

Participants & Sites

The participants in focus for this research are myself and Photoshop. As noted in Chapter 1, Photoshop and I have had a long collaboration together both as a visual culture producer myself and as a facilitator: I have introduced Photoshop to many people that I have taught and worked with over the past decade. However, my intent in acknowledging myself in the research is not a gesture to autoethnography, and possibly not a reflexive move, but rather an acknowledgement of my own instrumentality in calling the non-human to speak within the research. In a sort of role reversal for much of our relationship together, for this research I become the instrument and Photoshop becomes the focus of a non-human ethnographic inquiry.

In order to follow my non-human participant through the trajectories that emerged in the research, “design flexibility” (Rossman & Rallis, 1998, p. 84) is especially important to exploring non-human technological collaborators. In the age of digital technology the pace of innovation may cause disruption to data

collection or proposed data sources as technologies change. These changes may require modification to research methods: Parlett & Hamilton (1976) called this flexibility in design *progressive focusing*. It should also be noted that the nature of the study is not to provide all-encompassing conclusions, but rather to deploy new theory, based upon the intersections between ANT and theories of visuality, to offer some “*petite generalizations*” (Stake, 1995) and localized¹⁸ narratives about the ontological turn of the social sciences in relation to developing new theories of visuality in a social ontology. The possibilities of these findings are then be brought back to the field of art education to determine their potential effects in the conclusion chapter; this last movement I see in reference to DeLanda’s (2006) notion of scaling up in that it may be possible to take the effects from this small gathering, myself and Photoshop, and apply them to the larger assemblages from the a classroom full of students to the field of art education.

With ANT as my methodology, I devised sites for looking for the actant to speak as a mediator in translation. It should be noted that these sites are not singularly geographic locations, but should be seen more as spaces of the research and data collection that could be related to location, time, or conceptual space. Latour (2005) suggests four places of potential in making the actants speak: “study innovation,” “through distance,” and through “accidents” (p. 80-82).

These sites, and their overlaps, will be more pronounced in the following data

¹⁸ I am using the term “localized” in a double sense here. First, as Haber’s formulation that is in reference to the thinking of Lyotard (1979/1984) as a disruption of meta-narratives (Haber, 1994, p. 27). And secondly, in the ANT formulation of local which is an emphasis on following the actants in everyday, finite social practices (Fenwick & Edwards, 2010; Latour, 2005)

chapter, but I provide an outline in the following:

Study innovation: This research comes at a particularly salient moment as the release of Photoshop Creative Suite (CS) 5 was April 2010, and the new version was available to me as of April 2011. With the last version of Photoshop, called CS4, being released in October of 2008, CS5 presents an opportunity to look closely at the innovations within the new release to see how Photoshop “can be maintained longer as visible, distributed, accounted mediators before becoming invisible, asocial intermediaries” (Latour, 2005, p. 80). Generally speaking, the site of innovation is an orientation that looks forward, anticipates, and remains focused on the future-present.

Through distance: The site of distance searches for spaces of unfamiliarity with a concept or when the object becomes unfamiliar through novelty. This distance is a moment before “know-how, habituation, or disuse” renders the object as an intermediary. This can focus on innovation, but can also be a useful site for learning new skills and techniques that are new to the user not necessarily on the cutting edge of innovation with Photoshop’s development as a graphic design tool. There is also the capacity in this site to encounter long range views of historical perspective so that the distance in question is time based and looks backwards.

Through accidents: “Accidents” and “breakdowns” constitute this third site, and are conceived at the moments of malfunction that are immanent in any digital computing environment.

Through documents: Use of documents, archives, and the blogosphere¹⁹ is used to “artificially produce” our actant Photoshop as a mediator.

These sites are conceived as spaces in which to observe the actant Photoshop as an important non-human collaborator in producing digital visual culture and help to fill out my ethnographic pursuit of Photoshop. These sites locate themselves in opportunity: they come from experiences in a computer lab on the Ohio State University (OSU) campus, from my personal laptop computer in my home office, through an Internet website, at an Adobe sponsored demonstration, and in academic journals. Selection of sites was based upon what provided the richest data collection for making Photoshop speak. Further clarification of these decisions about site selection will be discussed in the data chapter. In the next section, I will outline the methods of data collection and the corresponding sites that mesh together in the pursuit of rich data.

Methods in Data Collection & the Data Corpus

Thinking through these sites of the research and looking for appropriate methods of data collection becomes somewhat like combing out messy, entangled hair. As prominent ANT scholar John Law (2007) has stated, “research needs to be messy and heterogeneous because that is the way it—research—actually is” (p. 596). The ANT research focus is to “follow the actors” (Latour,

¹⁹ I am using the term blogosphere to reference the immense amount of web logs: online personal or small group publishing spaces.

2005, p. 12) through translations in their formation of associations, which makes the initial conundrum of where to “cut the network” (Strathern, 1996). In other words, in the endeavor to get entangled in the messiness of social science research, what Lather (2007) calls “getting lost,” choices do need to be made in entering into the social ontologies that are to be of central importance. Some actants are recognized while others are inevitably Othered (Law, 2007). To remain faithful to an ANT investigation, I focus on following the actant Photoshop and staying local. As Tara Fenwick and Richard Edwards (2010) state “regardless of the starting point, an ANT approach focuses as soon as possible on the most local, particular details of a thing or actor as they go about the micro-activities of their day” (p. 149). For this reason, some of my cutting into the network has already been established through my experiences as an art teacher using a visual culture pedagogy working with students in new media technologies and in particular Photoshop, which has been a longtime contributor to these learning assemblages. The traces of Photoshop as a mediator in my classroom, forcibly making itself visible through many of the sites listed above, make it an apt actant to follow.

The methods employed to collect data as I follow Photoshop will take a two-pronged approach to constituting the data: 1) visual-narrative inquiry within the body of Photoshop and 2) analysis of the discourse body of Photoshop. These two approaches should be seen as a gathering of the various sites (innovation, distance, accidents, & documents) within the research where methods of data collection are employed. These areas of gathering are described as follows:

1) Visual-Narrative Inquiry of the GUI Body of Photoshop

At first the notion of the body of Photoshop admittedly sounds a little strange. I utilize my various research sites when focusing on the graphical user interface (GUI) through the changes that have been made in the roll out of Photoshop Creative Suite (CS) 5. My unfamiliarity with CS 5 at the commencement of this research allowed sites of innovation, distance, and accidents to provide visibility of the actant as a mediator. My method to record through both visual recording and narrative writing my interactions with Photoshop over a ten-week period as the sites of innovation, distance, and accidents erupt in my exploration of the newer version of Photoshop. The data was collected as a visual-narrative that consisted of a field journal that includes eighteen written narrative reflections totaling 45 pages, 22 screenshots from computer desktops, 17 word cloud visualizations²⁰, and 4 original graphics created in Photoshop and Adobe Illustrator.

The intent of the visual-narrative inquiry here, as Law (2004a) has suggested, is to “look down” and be concerned with the “sensuous materiality of practice and the scale-destabilizing implications of this materiality” (p. 21). Law contrasts this “baroque” looking down with a more “romantic” research gaze of “looking up” or the effort through research to conclude and summarize in order to “achieve an overview and pattern for the whole” (Fenwick & Edwards, 2010, p. 152). My looking down does not indicate a myopic approach to understanding an

²⁰ Word cloud visualizations were created using the applet “Wordle” found at <http://www.wordle.net> by Jonathan Feinberg and is licensed under a Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 United States License. More about my use of word clouds is found in the data chapter.

infinitesimal context, itself a sort of “abstract container” (Fenwick & Edwards, 2010, p. 152), but rather looks to the opportunities to assemble heterogeneous actants that may flow through different networks. Leander and Lovvorn (2006) argue that an ANT approach helped them to construct different literacy networks through which text-actants would flow, and avoided a “particular myopia in literacy studies of focusing on isolated texts or even textual practices” (p. 292). Similarly, it is not my intention to assemble infinitesimal visualities that only apply to Photoshop, but rather to see visuality within a social ontology to examine how visual technologies as actants flow through these networks in inter-actor-network formations. The method of visual-narrative inquiry allows a focus on my central actant Photoshop, but also employs multiple modalities of its actor-network as I examine discourses that surround it, record experiences in class using it, and use the software to create visualizations.

One possible problem with this approach is the actual surfaces of the GUI and their corresponding proprietary code. A GUI is essentially a performance of code, and code is written language. In particular to this research, a possibility to provide a blurring between the GUI body of Photoshop and the discourse body of Photoshop through the computer code that is the metaphoric genetic code of software cannot be realized due to the proprietary nature of Photoshop. In the nature of ANT, this proprietary DNA becomes a part of my assembling of the Photoshop actor-network.

2) Assembling of the Discourse Body of Photoshop

The other method in data collection will be to assemble the discourse body

of Photoshop. As Rosalind Gill (1996) explains, discourse is used to “refer to all things talk or text” (p. 141). However, texts should not be understood only as alphanumeric. Nelson Phillips and Cynthia Hardy (2002) state:

discourses are embodied and enacted in a variety of texts, although they exist beyond the individual texts that compose them. Texts can thus be considered a discursive “unit” and a material manifestation of discourse (Chalaby, 1996). Texts may take a variety of forms, including written texts, spoken words, pictures, symbols, artifacts, and so forth (Grant, Keenoy, & Oswick, 1998). (p. 4)

Discourse in this sense is a part of the material world that is manifest through language, but language in its most expansive sense. Much of the discourse on discourse in visual culture studies focuses on the work of Michel Foucault (Rose, 2007). Foucault’s influence over notions of discourse partially comes from his formations of discourse and their connections to power. According to Gilliam Rose (2007) discourse,

is powerful, says Foucault, because it is productive. Discourse disciplines subjects into certain ways of thinking and acting, but this is not simply repressive; it does not impose rules for thought and behaviour on a pre-existing human agent. Instead, human subjects are produced through discourse. Our sense of our self is made through the operation of discourse. So too are objects, relations, places, scenes: discourse produces the world as it understands it. (p. 143)

Therefore discourse is a useful material substance to continue to flesh out my Photoshop actant through the sites of distance, as in time, and documents.

There is also precedence within the field of art education for utilizing discursive formations to better understand slide projection technologies (Eisenhauer, 2006b), which indicates its usefulness to assembling visual technological actants

A distinction should be made between assembling a discourse body and discourse analysis to maintain an ANT ontological perspective. As Phillips and Hardy (2002) state, “discourse analysis is...distinguished by its commitment to a strong social constructivist view and in the way it tries to explore the relationships between text, discourse, and context” (p. 6). My commitment to an ANT methodology harbors much apprehension over social constructivism for the ways that it fills social practices with “social stuff” (Latour, 2005, p. 92), and instead looks for practices of constructivism or the construction of facts through the actants that coalesce within my social ontology. Additionally, ANT focuses on “research as primarily ontological practices and not primarily epistemological searches” (Fenwick & Edwards, 2010, p. 157-58). This emphasis on ontology brings into focus multiplicities, or what Annemarie Mol (2002) has called the problem of difference. Mol (2002) was one of the first ANT researchers to highlight how different worlds and different objects can be enacted together under one practice providing for understandings of multiple ontologies. In reference to Mol’s concept of multiple ontologies John Law (2004b) states:

We are not dealing with different and possibly flawed perspectives on the same object. Rather we are dealing with *different objects produced in different method assemblages*. Those objects overlap, yes. Indeed, that is what all the trouble is about: trying to make sure they overlap in productive ways. (p. 55)

I will explore the multiple ontologies of my differently assembled Photoshop actor network across discourse communities that are not whole and totally contingent by drawing on collecting texts as data from various resources.

The three discourse communities that I draw from are:

1. Academia (Google scholar search & OSU library search)

2. Blogosphere (Google web search)
3. Art education (academic publications focused on art education)

The method for collecting data from these discourse communities is to utilize search engines and locate search results using the keyword term “Photoshop” as a beginning and allow other important terms to emerge from the search. Again, I relied on sites of innovation, distance, and accidents to help mediate where Photoshop is speaking loudest as a mediator in its translations. Searching through different portals of the Internet provides almost infinite search results, and therefore the first 100 results were taken from each portal: Google Scholar, Google Web, and OSU Library. This was the initial phase of assembling the discourse body, and the flexibility of the design study allowed me to augment these results with other useful searches: namely Google image search and searching the Educational Resources Information Center (ERIC) database. Decisions to augment the data collection are provided with further detail in the following data chapter.

The selection of these particular discourse communities is intended to provide a variety of locations where Photoshop the actant can be seen as a mediator. For instance, the academic discourse community provided an assemblage of associations that is very different from the blogosphere. The art education discourse community was surveyed for articles that mention Photoshop directly, and this assembly yielded 9 articles from *Visual Arts Research*, 4 articles from *Studies in Art Education*, 9 articles from *Art Education*,

9 articles from *Arts & Activities*, and 10 articles from *SchoolArts*. This assembly was intended to access a more focused discourse community of art education scholarship as the disciplinary location of this dissertation, and to facilitate a return to the academic context that so richly informed how I cut into the network for this research in the first place.

In reflecting on the methods of data collection, the data corpus in this research is of varied forms: desktop screenshots, software how-to manuals, blog posts about images that have been “photoshopped,” articles about radiological recommendations for use of image enhancement, and my own autoethnographic narrative of performing with Photoshop just to name a few. The variety of spaces that I find Photoshop speaking (perhaps seeing is a better metaphor?) is diverse. John Law (2004b) characterizes these as “fluid results” in that the method of assemblage “depends on, grows out of, and is enacted by mechanisms of interference between practices which depend on separation while also insisting that they are joined” (p. 82). Achieving these fluid results as part of the rhizomatic complexity that is my methodology is an important part of understanding the assemblage as it is constituted through the research.

Data Analysis

Rhizomatic complexity oscillates between separation, or singularity, and connectedness, or multiplicity, and results in a “risky account,” i.e. textual account, that can afford the multiplicity to the actor-network Photoshop while still allowing the analysis to strive for a certain amount of coherence (Latour, 2005).

As Latour (2005) states, “a good text elicits networks of actors when it allows the writer to trace a set of relations defined as so many translations” (p. 129). These risky accounts may allow the social ontology of research actants to be recognizable through their traced translations as they are assembled in this research.

An important part of the methods for tracing these translations, or what is more commonly referred to as data analysis, is the use of the three movements in the technological ecology, digital chimera, and network being to help structure the coding of emerging gatherings that cohere within the tension of singularity and multiplicity. In other words, these movements in social ontology are operationalized as an interpretive structure in the data analysis that will help to pull out the entangled connections of the actor-network formation of Photoshop, and presented in the data analysis chapter. As coding devices, the three movements will act as a triangulation of the social ontology of visual technologies that I am pursuing, and provide contact points for structuring the inter-actor-network formation of visual technologies and visibility. John Law (2004b) uses the language of poststructuralism to frame the fluid effects of his methods of assemblage when he states, “what is being made present always depends on what is also being made absent” (p. 83). In the nature of my investigations in the ontologies of visual culture, I would frame my movements as the space-time areas of what I have chosen to make visible and have, without escape, rendered other translations invisible. Although the movements themselves remain fluid and

emerge within a tension of singularity and multiplicity, there is the inevitability of rendering invisible certain actants, translations, and assemblages.

With this in mind, I organized the movements in the following table to help structure their use as analytic devices by identifying what sorts of translations they will help to make visible:

Movement	What's visible
technological ecology	mutual resources, movement of resources, dominate groups, situated knowledge, sustainability
digital chimera	data-bodies, skeumorphs, virtual potentialities, multiplicity, remediation
network being	actants, translations, assemblage, scale-free networks, topology,

Table 1. Three movements and what they help to make visible

This interpretive structure is used to analyze the assembled translations present within the social ontology of Photoshop that is provided in the data analysis chapter.

In summation, the methodology is meant to be an emergent structure much like network formations themselves, and endeavors to make Photoshop visible as an actor-network. Through the sites of innovation, distance, accidents, and

documents, I look for the traces of translation between Photoshop and myself and within broader discourse communities where Photoshop is also visible as a mediator. These discourse communities (academic, blogosphere, and art education) were selected for their potential through scale: the academic and blogosphere being greater scale and art education being a more focused discourse community that has particular relevance for this dissertation. These fluid results are analyzed using the three movements (technological ecology, digital chimeras, and network being) as an interpretive structure and an instrument of visibility that helped me to make choices about where I cut the network. However, these movements, in the spirit of ANT methodology, are fluid themselves, and are constructed through an emergence consistent with the tensions of singularity and multiplicity. The network that surfaces from the data corpus is used to articulate an inter-actor-network formulation of the visual technology Photoshop and a visuality.

Chapter 4: Data

Reassembling Photoshop

Throughout the previous chapters there has been an emphasis on structuring symmetry to human and non-human actors within social ontologies, and in particular for this study constructing the human-technological hybrids that effect teaching and learning in the art classroom. As a result of this symmetry, this study endeavors to articulate the actor-network formation of a specific visual technology, Photoshop, that has been important as a non-human actant within my own teaching experiences and within the broader community of makers in a digital visual culture. The reach of Photoshop into the lives of students and teachers within an expanding technological ecology has reached an ever greater proportion of users as visual technologies and the corresponding distribution apparatus of the Internet have reached a deeper saturation of daily life. The proliferation of makers within a digital visual culture is not without its attachments to opportunity and privilege, but there is no doubt that, even with the unequal

distribution of opportunity, the scope of inclusion has only gotten broader (Watkins, 2009). As a result the opportunity to reassemble Photoshop, to gather its mediating agencies that propel the bodies of Photoshop, both the GUI body and the discourse body, into translation, returns the somewhat disjointed written account that comprises this chapter. In this chapter I showcase the ANT methodology of the research following the translations of my actant to construct Photoshop as an actor-network, and in the subsequent chapter on data analysis I will interpret the Photoshop actor-network through the movements of the technological ecology, digital chimera, and network being. The focus of this chapter is to make visible the translations that emerged through this study before the analysis of the movements can occur.

The account that follows is a measure of Photoshop beyond its instrumentality and singularity as a self-contained piece of software, and instead assembles a social ontology. In assembling the actor-network formation of Photoshop through its translations, the heterogeneous sites of its presence begin to emerge in rhizomatic formations. As Deleuze & Guattari (1980/1987) state, these rhizomatic formations “ceaselessly establishes connections between semiotic chains, organizations of power, and circumstances relative to the arts, sciences, and social sciences” (p.7). The rhizome has been an important marker within the research as a synonymous expression for the network and an important metaphor for the social ontology under investigation. This section will lay out the nodal parts of this emerging network formation, and its initial eclecticism is framed as a generative characteristic of the “rhizomatic validity” (Lather, 2007) targeted in the research design. From articles that extoll the virtues

of scientific rigor and use of Photoshop in histochemical visualization (Rossner & Yamada, 2004) to the re-presentation of Photoshop “fails” through the crowdsourcing of a visual blogging community (Photoshop Disasters, n.d.), Photoshop looks like something very different than a “mere tool” (Rushkoff, 2010, p. 8). Rather, through this gathering of mediators selected from the data a cloud of forces that determines its facility to be a partner in collaboration of the infinite variety of the digital visual culture in which we live, if only temporarily, starts to take shape. If anything is evident from what follows, it is that Photoshop itself is a movement of agencies, and that the reassembling that I present here is constituted of durable and fragile nodes of its translation that holds only as long as this study follows the actant Photoshop. Whatever the current moment conveys within this rhizomatic portrait of Photoshop, every effort was made to remain close to the actant and follow it through its many translations within this study.

In order to perform the social ontology of Photoshop, to reassemble representations of its “semiotics of materiality” (Law, 1999, p. 4), I present in this chapter written accounts of mediators in the gathering of the Photoshop actor-network selected from the data corpus. The data corpus in its entirety includes my field journal reflecting upon my collaboration with Photoshop in a number of different contexts: through teaching a course at OSU that uses Photoshop, through my daily review of different news and visual blogging websites on the Internet where Photoshop appears, and at an OSU event called Adobe Day. In

addition to the field journal, I have three sets of initial search engine results, totaling 300 entries, from using the Google Scholar, Google web, and OSU library search engines. These initial searches are then augmented with additional search strategies that were targeted to attain translations of a certain substance, for example using the Google image search to see translation in the impossible beyond language that is a part of the focus of a visual nature-culture. Reflective notes and word cloud visualizations were used to work the data from the search engine results to determine where mediators emerged through translation with the Photoshop actor-network. These translations showcase “the ability of each actor to *make* other actors *do* unexpected things” (Latour, 2005, p. 129), and are drawn from both the discourse bodies of the study and my own visual narrative of the actant Photoshop as it became unfamiliar within my work with the GUI body of Photoshop. Again, a focus should be maintained on my own role as an instrument within the research to determine mediators, and although I try to take advantage of opportune moments and other types of research methods to work the data, my own gaze upon the data indicates my implementation of this ANT methodology and continually reinforces the symmetry between Photoshop and myself in the data. For example, as noted in the methodology, the investigation of the GUI body comes at a particularly opportune moment as the transition from Photoshop CS4 to CS5 has taken place recently within my work space. Many of the accounts of the GUI body arise from my field journal as I recount interactions from a course that I teach at OSU titled Art Education 252: The Computer In Visual Arts, and the new version of Photoshop CS5 has been installed within the computer lab where I teach the course. The installation of CS5 provided an

opportunity for me to highlight its differences as it evoked sites of innovation and accidents in working with my students in familiarizing them with this complex graphics software. Habits of using the GUI in the process of demonstrating its capabilities to my students were, at times, forced into a state of disruption as the software changed or introduced new features. The teaching experiences that required my improvisation with the software were highlighted through my field journal as moments where GUI components became mediating parts of the Photoshop body. These field journal entries and the accompanying screenshots of Photoshop on the computer are part of what constitutes the visual narrative that is a part of the data corpus that presents the GUI body of Photoshop.

Other examples of my implementation of an ANT methodology used to evoke mediators within the parts of the data corpus that deal with the discourse bodies of Photoshop include several methods. In order to constitute the discourse bodies of both the academic and blogosphere locations search results were compiled through three different search engines²¹: 1) OSU library search, 2) Google Scholar, and 3) Google web search. The first two were used to constitute the academic discourse body and the second was used to constitute the blogosphere. However, the blogosphere was also filled with opportunities from my own encounters with Photoshop within popular culture of the blogosphere, and my own daily habits of checking certain blogs and maintaining notes on

²¹ In any of these cases the search engine itself should be acknowledged as a collaborating actant within the research endeavor as its algorithms massage keyword entries of my choosing to output results that are very much contingent on the search engines ability to collect, organize, and search a constellation of resources available online. Although this collaboration with search engines is not ignored within this research, it is also not the central focus of my study.

websites that mentioned Photoshop or its more common popular cultural use as a verb (photoshopped).

As a matter of practicality, when search engines were employed search results were limited to 100 of the top ranked results. This number was arrived at to give enough data to constitute a broad range of entries and to not overly emphasize the methods of search in terms of the individual search engine's ranking algorithm. In order to further manipulate the data of the search engine results to further evoke mediators in translation with Photoshop, I employed the use of a word cloud visualization engine (see <http://www.wordle.net/>)²². This allowed me to focus on names and terms that were repeated in the search results and indicated to me their presence as a mediating agency within the actor-network of Photoshop. I manipulated the data visualization so that the word cloud would only display a pre-determined number of words that occur with the greatest frequency within the submitted search results, and so the figures show word clouds composed of the top 100 words that are most repeated in the search results. The bigger the word in the word cloud visualization the more times it appears in the search results: therefore it is no surprise the biggest word in each word cloud is "photoshop." For the presentation of word clouds in this chapter the term "photoshop" is removed from the search results so that other terms that occur with high frequency may be more legible to the reader (see Figure 1 & 2 for comparison).

²² To see a precedent in using word cloud visualization in art education scholarship see Sweeny, 2010a.

prominence in the word cloud. Many of the terms are expected and provide little in the way of translation, and therefore are interpreted as intermediators. Latour (2005) characterizes intermediaries as “what transports meaning or force without transformation” (p.39). For example, the intermediary terms in the Google web search word cloud (Figure 2) would be terms like *software* and *digital* as they are important to Photoshop, but do not “transform, translate, distort, [or] modify the meaning” (Latour, 2005, p.39) in the construction of the Photoshop actor-network. Therefore, size alone in the word cloud is not the only important indicator to my formation of the mediators in translation with Photoshop that constitute it as an actor-network.

Again, the objective of this chapter is to reassemble the mediators gathered through the different bodies of Photoshop and represent these mediators in translation. These translations constitute the Photoshop actor-network so that a heterogeneous non-human collaborator can begin to emerge through the data. It should be noted that the effort to maintain the symmetry of the human technology collaboration was forefronted through my own devising of data manipulations and moments of opportunity that arose in my use of Photoshop in Art Education 252, the serendipity of finding “photoshopping” in the blogosphere, and my concentrated efforts to evoke the mediators in translation with Photoshop within the discourse community of art education.

To assemble the translations from the art education discourse community, I utilized a range of search methods to constitute the discourse body of Photoshop: using search engines sometimes with results that overlapped as with Michael J. Emme and Anna Kirova’s (2005) article published in *Visual Arts*

Research that was a part of the Google Scholar results, using more specialized databases such as Educational Resources Information Center (ERIC), and looking through the physical stacks of bound journals at the library. This is very much an endeavor that relates specifically to Photoshop's collaboration with me, my pedagogical practice in art classrooms, and my position researching within the field of art education. This symmetry is vital to the study to reinforce the proliferation of agencies and not the replacement of agencies within the research endeavor from human to non-human. In my particular case, the scholarship of art education might not have emerged as a mediator within the construction of the Photoshop actor-network at all if it were not for my presence as the balancing counterpart to the Photoshop actant. This may relate to the static performance of search algorithms in not pulling resources without direct keyword matches related to "art education," but it also may suggest the lack of symmetry within the field for acknowledging non-human collaborators by name and their absence within the research agenda of any educational field.

As a part of constructing the Photoshop actor-network for this chapter, selections of the strongest mediators in translation were taken from the data corpus and framed as nodes in the somewhat chaotic collection of written accounts that follow. My assessment of the strength of a mediator, and hence its inclusion as a node, was determined by its prominence in the data corpus or its development of unexpected translations through its low frequency. For example, the term "kelby" is prominent in many of the search engine results and led to a

node dealing with an investigation of Scott Kelby and the publishing industry in translation with Photoshop. Alternately, the low frequency of certain search results were interpreted as significant anomalies within the search results that erupted unexpected translations with the Photoshop actant. An example of this would be the inclusion of the node related to free and open source alternative software that was chosen for its unexpected translation of the Photoshop actant as *not* Photoshop. My reasoning for using prominence and anomaly to assess the strength of the mediators is that it provides the richest gathering of translations and a robust rhizome to constitute the Photoshop actor-network.

To assist in understanding the construction of the Photoshop actor-network through these nodes, I provide a mapping visualization to layout the nodes of the network formation to help visualize the reassembling of the Photoshop actor-network not as a hierarchy or ordered list (see Figure 3).

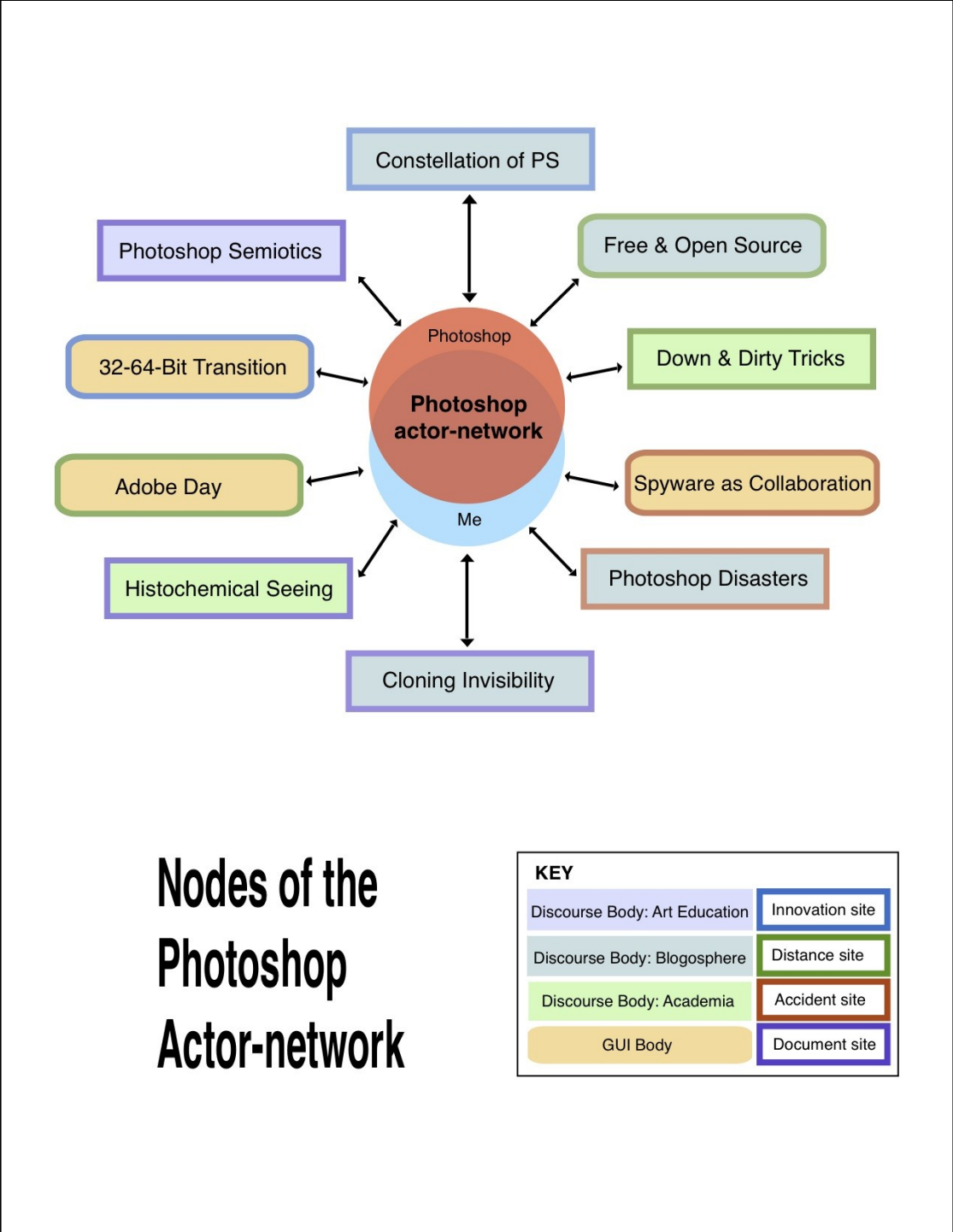


Figure 3. Visualization of the mediators that constitute the Photoshop actor-network

The map illustrates the relationships of the nodes to the methodology in that it articulates the methods and sites that are of primary characterization to the node. My selection of which mediators to represent within the nodes reflects what ANT sociologist Michel Callon (1986) would call the “obligatory passage point” or the problematization which would define the perimeters for entering the network under consideration. These nodes are presented as the strongest mediators involved in translation with the actant Photoshop taken from the data. They evoke an unexpected way of doing something to/with Photoshop, and return through the reassembly by way of the obligatory passage point: more directly to addressing the primary research question and subquestions as to how the case of Photoshop as actor-network can illustrate the social ontology of a visual technology when it is conceived as a human-technological hybrid.

NODE: A Constellations of Software: The Many Photoshops

One thing becomes clear when consulting the various search results that constitute the discourse body of Photoshop: Photoshop is a constellation of products and not just one piece of software. In the Google web search the majority of the top ten results all connect to photoshop.com. In the OSU Library search results the brand of Photoshop is labeled onto other software without a clear connection to the original graphic design software. What becomes difficult to determine is what are the decisions behind Photoshop branding and the various software packages. The various incarnations of Photoshop can be seen as a derivative of meeting market needs for certain types of Photoshop users: for

instance trying to package a set of tools most appropriate for digital photographers versus graphic designers versus novice users. One thing is clear, the marketing power of the word “Photoshop” spins all software derivatives in translation with its origin as a raster-based image manipulation software.

What is also in translation is the user within the technological ecology in that the evolution of Photoshop is co-constitutive of the Photoshop user. As photographers went digital so too did the ecology of equipment, software, and storage devices. As digital photography went mainstream so did the need for desktop digital photography software. Adobe is designing software and designing users.

Speculation may insist that software development is a response to user needs, but sometimes software solutions are ahead of need, or would need to be on the edge of anticipating needs otherwise there would be no reason to pay for Photoshop. In a technological ecology that also offers a number of free options in graphic design software, it is hard to imagine how else Photoshop could compete in such an environment. There are of course issues beyond innovation that allow Adobe to keep customers paying for software: the support of publishing books and websites, their position as a dominant software producer within the market, and their offering stability in software releases certainly provide some advantage. However the question remains, how do they continue to compete against something that is free?

One answer would be to increase their ability to answer and anticipate

user needs to provide the most comprehensive set of content-rich software available, and hence the proliferation of Photoshop into a constellation of options: Express, Elements, Creative Suite, and Lightroom. All are Photoshop, but each takes a certain sector of the user market for graphic design software and exploits that particular sector's needs. Outlined below is a synopsis of five actors within the Photoshop constellation:

1) Photoshop Express (Photoshop.com, 2011)

This mobile application, released for both Google's Android and Apple's iOS operating system for smartphones, taps into the widening use of digital photography through cell phones and mobile devices. As smartphones have impacted the market for point-and-shoot digital cameras (Grobart, 2010), there has been an expanding small application market for image editing in mobile technologies. This has been a boon for smaller developers resulting in a software ecosystem galvanized around operating systems for mobile devices offered through application stores (Mace, 2008). Photoshop Express is a limited photo editing program that allows you to edit images, upload images to social media websites such as Twitter and Facebook, and archive your image files to an account at photoshop.com. Photoshop.com serves as a cloud computing resource that makes images available wherever there is an Internet connection. Despite the somewhat limited image-editing capabilities of Photoshop Express, this part of the constellation allows Photoshop to remain in translation with some of the most current trends in mobile devices and cloud computing.

There is an interesting part to this translation that involves the changing

nature of the interface and interactivity due to the wider use of touch screens in smartphones and computer tablets. In Photoshop Express you use your finger directly on the image to make shifts in whatever adjustment you are trying to achieve whereas with mouse-based interfaces you are moving a GUI slider or other such graphic device for most image adjustments. In addition, there is the introduction of Photoshop Touch Apps for CS5 which are smaller mobile apps to import to the desktop version of Photoshop. The idea here is to facilitate a network of devices that Photoshop can use so that a drawing from a computer tablet can go into the desktop environment where the user can continue to work on it. These developments centered around mobility and touch are fundamentally changing Photoshop from a standalone program to a constellation of software, devices, and interfaces. As touch screens become more common, this kinetic form of the interface may continue to involve Photoshop in translation.

2) Photoshop Elements

Photoshop Elements is described by Adobe (2011d) as:

The #1 selling consumer photo-editing software*

Simply unlimited! Adobe® Photoshop® Elements 9 photo-editing software delivers powerful options that make it easy to create extraordinary photos, quickly share your memories in Online Albums and unique print creations, and automatically organize and help protect all your photos and video clips. (n.p.)

The statement says it all: Elements is for editing digital photos, uploading them, and tying into Adobe's cloud computing network where you can also get things printed. It is a software photo store, but it is so much more. The screenshot

comes right after the above quote and there is a short video of the effect that makes “unwanted elements vanish with one stroke of the enhanced Spot Healing Brush” (Adobe, 2011d). That bee never existed! (see Figure 4):

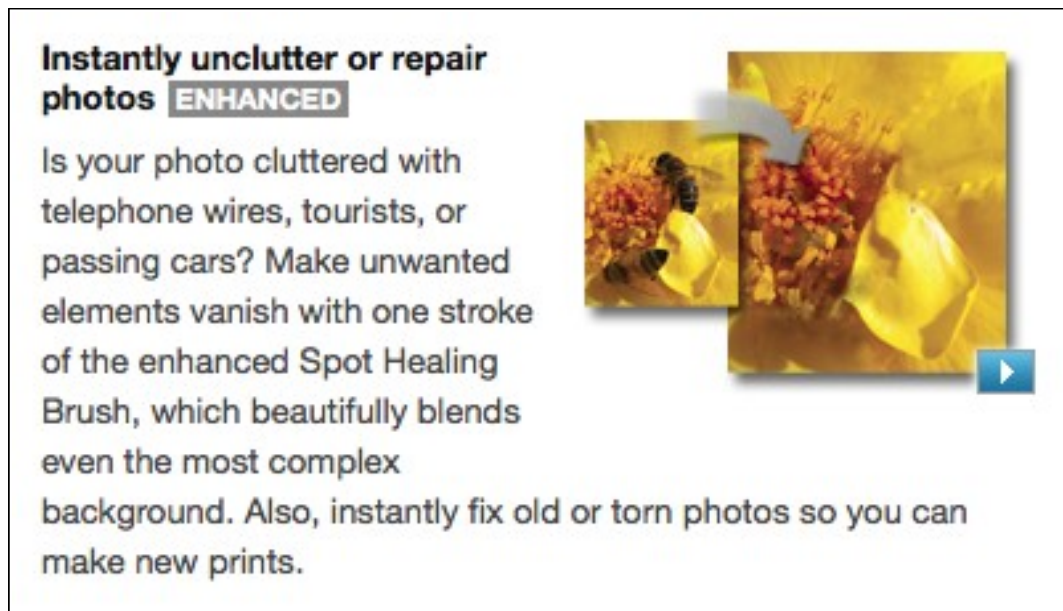


Figure 4. Screenshot image of spot healing brush effects in Photoshop Elements 9 (Adobe, 2011d)

The translation of Photoshop is the novice controlling the image, but not controlling Photoshop: Photoshop does the work for the user. This notion of Photoshop automating the photographic process is in focus for the Photoshop Elements user. Another option called the Photomerge merges separate photos with little effort so that “you can create the perfect photo your camera couldn't capture” (Adobe, 2011d). Both of these image editing options are available in Photoshop CS5, but there is a very different user in mind.

3) Photoshop CS5

Photoshop CS5 is what I use in my classes, and is the most robust option or so I thought: there is a CS5 Extended that includes more 3D and motion graphics options. There are an almost unlimited array of options in Photoshop CS5, but to position the translation of innovation within the roll out of the new version, Adobe (2011b) states:

Adobe® Photoshop® CS5 software redefines digital imaging with breakthrough tools for photography, selections, and more. And now, use it with creativity- and productivity-boosting mobile device apps as they become available. (n.p.)

Some of these innovative features that are highlighted on the webpage are complex selections made easy, content-aware fill, superior HDR imaging, mobile integration (this is Photoshop Touch interfacing technology for tablets and mobile phones that was mentioned in the previous discussion on Photoshop Express). To understand what these options are capable of already involves Photoshop in a translation of more expertise, an insider language for graphic design and photography professionals.

4) Photoshop CS5 Extended

The translation of the insider is increased through Photoshop CS5 Extended. Adobe (2011c) states:

the ultimate solution for advanced digital imaging, delivering everything in Photoshop CS5 plus breakthrough tools for 3D and motion editing. And now, use it with creativity- and productivity-boosting mobile device apps as they become available. (n.p.)

Some of its main features are content-aware fill, enhanced 3D realism and rich

material, 3D extrusion with Adobe Repoussé, and mobile integration (Adobe, 2011c). Photoshop CS5 Extended is an even newer innovation, and the translation doubles back as the user becomes a 3D animator, engineer using rapid prototyping, and spacial architect.

Both the Photoshop CS5 and CS5 Extended appear to be the design industry standards. Both versions are not a “black box” (Latour, 1987, p. 4) that do it for the user, but instead can do it all. What especially drives the insider-professional translation of Photoshop are the videos that are featured at the top of the webpages that describe both versions. For Photoshop CS5, there is a video of Tim Tadder, “modern master of commercial photography” (Adobe, 2011b), working and talking about CS5. On the CS5 Extended webpage there is no user highlighted, but rather an animation that showcases some of the software itself and positions CS5 Extended as the avant garde of Photoshop development. The strangeness of the Photoshop software featured in its own mini-documentary, like an artist showing their virtuosity, makes it hard to reflect upon it simply as a tool.

5) Photoshop Lightroom

Photoshop has been in translation with digital photography for a long time, and Lightroom presents an interesting niche within the software constellation.

According to Adobe (2011e), Photoshop Lightroom 3 is

software helps you bring out the best in your photographs, whether you're perfecting one image, searching for ten, processing hundreds, or organizing thousands...Create incredible images that move your audience. Experiment fearlessly with state-of-the-art nondestructive editing tools. Easily manage all your images. And showcase your work in elegant print

layouts, slide shows, and web galleries, as well as on popular photo-sharing sites. All from within one fast, intuitive application. (n.p.)

Adobe highlights several strengths to Lightroom: nondestructive editing, file management, and image sharing. Many of these options can be performed in CS5 as well, but Adobe has made a point to emphasize it here as localized within “one, fast intuitive application.” However, the user seems to be a strange in-between:

If you're an advanced amateur or professional photographer, you need a wide range of tools to keep your digital projects creative and organized. Lightroom provides all your essentials in one intuitive package. (Adobe, 2011e, n.p.).

So it is for amateurs and professionals alike for whom image archive management is important. Lightroom also reinforces the technological ecology in its relationship with CS5. Each software can link workflows through one another so that any image archived in Lightroom can be brought into CS5 to be edited and the effects of the adjustments are reflected in the Lightroom work space. So the translation shifts slightly from the continuum of expert to novice and instead Lightroom is in translation with the traditionalist: photographers, not graphic designers or people who make up images, but rather those that are working from what the camera captures. It is not so much a purist stance but one of purity: compositing images is a very different practice than tweaking brightness or exposure. There is a sentiment that somehow the one is photography and the other is not. However, it does seem to address for the novice or the expert the

proliferation of digital images, and their accumulation, that is increasingly a organizational problem for users of smartphones, point-and-shoot cameras, and digital single-lens reflex cameras. The technological ecology has an abundance of image resources.

Within the constellation of Photoshops there is translation with an equally complex constellation of users: novices, photo professionals, designers, 3D animators, experts, traditionalists, etc. There is overlapping potential and shared resources that influence brand identity of the many Photoshops that is sliced along categories of budgetary restrictions of the consumers, intended use, and perceptions of the user identity. Despite the constellation of software offering the various choices, the translations between software design and user design ultimately are impossible to disaggregate.

NODE: *Not* Photoshop: Free and Open Source Software Alternatives

Within the constellation of Photoshop that appeared through out the search results of the discourse bodies, there was one anomaly that was outside of the constellation but still in translation with Photoshop: free and open source software alternatives. It is an anomaly because of its low prominence within the search results: only four hits listed in the Google web search results reference these alternatives. However, the strength of the translation arises from these software alternatives being in translation with Photoshop as *not* Photoshop. In other words their presence within the search results is seen as a significant

translation of Photoshop for the tensions that they induce within the discourse bodies of Photoshop. Specifically, the free and open source image-editing software that are in the results as an alternative to Photoshop are Pixlr Editor, GIMP, and Amazifier. The fourth search result links to a website that has an entire page listing open source alternatives to Photoshop (see www.osalt.com/photoshop). These free and open source alternatives, by their existence, question the market of proprietary software where purchasing and policing of licenses is a part of doing business and is foundational to the constellation of Photoshop. The feature-rich Photoshop constellation provides incentive enough to continue using Photoshop, but literally at what cost?

Outside of the discourse body, the translations of proprietary software and free and open source alternatives emerged in my field notes as I reflected on my collaboration with Photoshop as a user and as a teacher in Art Education 252. I usually advise students to buy Photoshop if they anticipate using it extensively in their future, but if not to utilize the university labs. Once project work builds toward the end of the quarter, I suggest they download the free trial version of Photoshop from the Adobe website where you can test out the software for a month before being required to buy. However, early in the class this creates a tension for students as they struggle to grasp this complex new software. An early entry from my journal states:

What the real problem is the availability of the software outside of class. It is too early for them to get the free trial version and most of them cannot buy a version of PS because it is too damn expensive. So what am I really teaching here? (April 6, 2011, PS is an abbreviation for Photoshop)

My question of what is a part of the curriculum in this situation of proprietary software becomes an important pedagogical struggle, a translation of the ethics of proprietary software in relation to the outcomes of learning within my class. Toward the end of the quarter, I had the opportunity to talk with some students about how they problem-solved around their needs for using Photoshop in project work. My journal states:

Today was the last class and an interesting conversation came up about where students use Photoshop. Toward the end of class the environment was more casual and so I was curious if students had bought PS, taken it from a friend or found it illegally in another way. Some said they bought it, but many said they had taken it from friends. One student described a way to download the free trial version and then use a key generator software that will make up a key for you and then you have the software for free. (June 1, 2011)

In many cases, students opt to get a copy of Photoshop either through a friend or by downloading it from an illegal source. The translation of a free and open source alternative that enters the discourse body of Photoshop becomes a translation with proprietary software as students use key generating software to hack trial versions and copy illegal versions onto their home computers.

This translation continues through the larger collection of Art Education 252 course offerings and the service learning section. This section of the course visits off-campus computing labs that utilize the free and open source image-editing software known as GIMP, which stands for the Gnu Image Manipulation Program, and is one of the free software alternatives that is a part of the Google web search results discussed earlier. Even though I do not teach the service

learning section of Art Education 252, as a result of this course and its need for GIMP, this free and open source alternative is loaded on the computers that all sections of the course use including my class. However, my long time collaboration with Photoshop has kept me from utilizing GIMP to address some of the tensions introduced through my students barred access to Photoshop. My journal states:

Of course there are sections of our service learning that use GIMP. Part of the service learning class is to work in the off-campus lab that is maintained by Free Geek Columbus with only Linux operating system stuff and that means GIMP for image editing. I have toyed with the idea of using GIMP, but I never seem to get around to it. (April 6, 2011)

Within this node there is the translations that involve the alternatives of *not* Photoshop for the ways that they question the cost, both monetarily and in the educational cost, of using proprietary software, but there is also translations of my own collaboration: my status as the Photoshop insider and expert who understands the constellation of Photoshop and renders its collaboration as a part of the course curriculum.

NODE: Down & Dirty Tricks: Photoshop and Publishing Technical Manuals

Who is Scott Kelby?

Kelby is the dominant author in both the Google Scholar search and the OSU library search results, and through this prominence is considered an

important mediator for Photoshop in the world of publishing technical guides.

Kelby is a media mogul who has built an impressive empire of companies all focused on developing classes and tutorials for visual design professions and the software that is used. Whether through print publications, online classes, e-books, and even video casts through Kelby TV. He has a total of eight print publications where he is listed as a lead or solo author from the OSU library search results:

1. The Adobe® Photoshop CS3 book for digital photographers
2. The Photoshop Elements 8 book for digital photographers
3. The Adobe Photoshop Lightroom 2 book for digital photographers
4. The Adobe Photoshop CS4 book for digital photographers
5. Photoshop CS4 down & dirty tricks
6. The Photoshop elements 7 book for digital photographers
7. The Photoshop elements 6 book for digital photographers
8. Scott Kelby's 7-point system for Adobe Photoshop CS3

From these results it appears that Kelby is focused on the digital photographer market, but he does appear to diversify his software focus for his intended audience, which remains the same, so you get publications for Photoshop Elements focused on tips for digital photographers. Kelby got in on the ground level in publishing a book focused on Photoshop 6, and he has been publishing revised versions of that book with each new version of Photoshop.

Kelby's citations that are in the Google Scholar search, either in reference or as a search result, are: The Adobe Photoshop CS4 Book for Digital Photographers; The Adobe Photoshop Lightroom Book for Digital Photographers; The Photoshop Elements 5 Book for Digital Photographers; and a citation to something called "down & dirty tricks." This last one I find particularly strange: what is the tone of an educational textbook like this? The back cover copy for

Adobe Photoshop CS Down and Dirty Tricks (Kelby, 2003) reads:

You'll learn the most closely guarded inside secrets for creating the latest cutting-edge effects, including techniques that have never been revealed before anywhere! And the book is written so clearly, and is so easy to follow, that you'll be able to create every one of these amazing effects yourself.

So down and dirty is discourse of the insider/outsider, and Kelby is giving you the down and dirty access to be an insider as a Photoshop "master" (Kelby, 2003).

However, as with his other publications, this one gets recycled over and over again with new versions of the software. The back cover copy to *Photoshop*

CS4 Down and Dirty Tricks (Kelby, 2009) reads:

You'll learn some of the most closely guarded Photoshop CS4 special effects—the same ones you see on TV, in magazines, and on the Web. Using Scott's simple step-by-step method, with hundreds of full-color images, you'll see exactly how it's all done. The book is written so clearly, and it is so easy to follow, you'll immediately be able to create all of these effects yourself.

If you look carefully at the two descriptions there is really no difference between the two publications, and the content of the books equals this paraphrasing effect. In a side by side comparison of the bulleted lists of features of each edition of the Down & Dirty series there is little to no difference in the descriptions of insider features:

2003	2009
<ul style="list-style-type: none"> • Tricks professional photographers use to show off their work • The most popular effects used by the big Hollywood studios • The latest cutting-edge photographic special effects • How to fake all kinds of studio shots (you'll be amazed how its done!) • The type effects that are most in demand by clients • How to get stunning 3D effects without using a 3D program • How to turn simple snapshots into museum quality gallery prints • The most asked for new Web effects • Plus loads of advanced effects that look hard, but are easy, once you know the secrets 	<ul style="list-style-type: none"> • The latest photographic special effects • How to fake studio shots (you'll be amazed at how it's done) • The latest cutting-edge type effects • The most popular effects used by big movie studios • The most-requested advertising effects • Commercial effects that clients go crazy over! • The most asked-for current Web effects • Amazing 3D effects using Photoshop Extended • Plus loads of effects that look hard, but are easy once you know the secrets

Table 2. Comparison of two editions of Scott Kelby's *Down & Dirty Tricks*

The features are really a jumbled remix of the same thing from the 2003 version to the 2009 version, but Kelby is only one example of a larger trend within the technology publishing industry that utilizes this form of mutating publication, whereby content is serialized according to software roll out. In reviewing the search results from the OSU library, which tended to be heavily laden with technology textbooks instead of articles, there were two other authors that were

listed with at least five publications: Jeff Carlson and Barbara Brundage. Jeff Carlson had the following publications as a part of the OSU library search results:

- Photoshop Elements 8 for MAC OS X (2010)
- Photoshop Elements 8 for Windows (2010)
- Photoshop Elements 7 for Windows (2009)
- Photoshop Elements 6 for Windows (2008)
- The Adobe Photoshop Express Beta Pocketguide (2008)

Barbara Brundage exhibits a similar publication record when looking over the OSU Library search results where she is listed as author:

- Photoshop Elements 8 for Mac (2010)
- Photoshop Elements 8 for Windows (2009)
- Photoshop Elements 7 (2008)
- Photoshop Elements 6 (2008)
- Photoshop Elements 6 for Mac (2008)

With head to head competition in the Photoshop Elements market, these two authors are publishing rapid editions, sometimes twice a year, for various technology-centric publishers: Brundage for O'Reilly publications exclusively and Carlson for Peachpit Press mostly. These observations of the data are not so much mediating factors as one would expect print publications focused on learning industry software. However, Photoshop is thrust into translation when the distribution of publication materials must embrace the rate of development in software versions: a new version of Photoshop is rolled out roughly every 12-18 months. This makes learning materials related to Photoshop unique to other textbooks and support materials in the learning environment. Couple this rapid publication cycle with the hyperbolic rhetoric of the down and dirty secrets that

pervade much of the marketing for these books, and the learning materials within the technological ecology are a part of the translation of the actant Photoshop.

NODE: Spyware as Collaboration: The Adobe Product Improvement Program

The translations of the insider/outsider of the technical manual publishing industry is a prominent collaboration in learning Photoshop. However, there is a reversal of this translation, Photoshop learning from its users instead of users learning about Photoshop, through the crowdsourcing methods employed by Adobe in CS5. Crowdsourcing can be a way of letting others into the process of decision-making by leveraging Internet connectivity to solve problems. It has received a lot of attention as a buzz word for the potential for many voices to speak out in a decision, but also can be deployed to let the crowd determine which are the better answers as they filter to the top of the possible options. However, the issue is never completely win-win. For example, there is a very interesting example of the chocolate company Cadberry doing a contest to have people design the label and it turns out that the winning entry was a forgery (Bosher, 2010, March 25). Nonetheless, there is merit to having the work of many minds focusing on the same problem especially when you can leverage user communities through social media (see Jenkins, 2006, for cases studies in fan culture).

Crowdsourcing enters into translation with Photoshop through the GUI body of Photoshop when an unexpected dialogue box interrupted a

demonstration that I was conducting in my Art Education 252 course. My field journal states:

So I am in class today and demonstrating the interface in PS. I take the first day to talk about the MacOS for those not familiar and then we open up PS and I describe the work area: toolbox, subsettings, menu bar, palettes) I often linger in the palette area and start to talk about the Layers Palette...Ok so as I am going on about Layers being the most important thing in PS, when a dialogue box pops up asking to sign up for the "Adobe Product Improvement Program." (March 30, 2011)

This was literally the first demonstration I had conducted in front of the class, and I often approach the task as if touring a room when I am describing the various GUI parts of the interface. The unexpected dialogue box (see Figure 5) popped up in the middle of the screen and blocked most of the Photoshop GUI behind it.

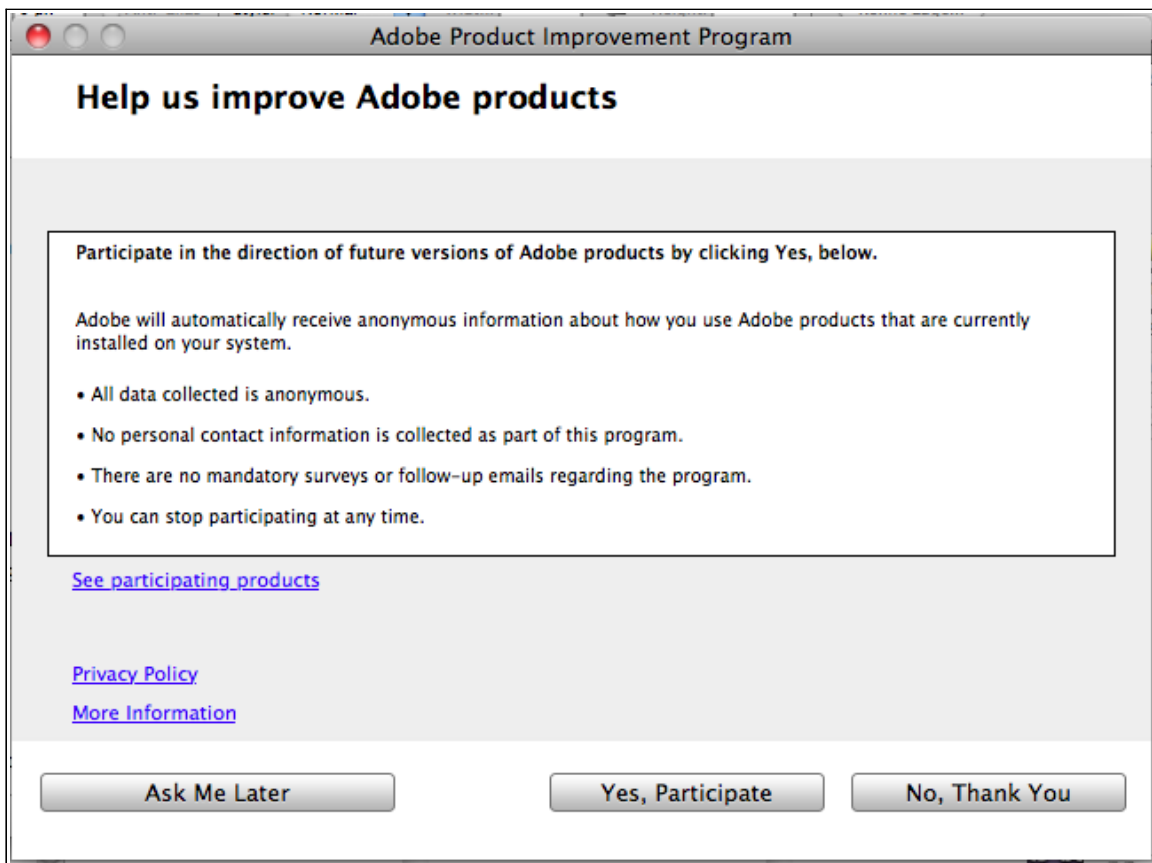


Figure 5. Screenshot of the Adobe Product Improvement Program invitation window.

The invitation window is asking users to send anonymous information about "how you use Adobe products" that will be collected to influence future versions of Adobe products. As my field journal indicates, the phrase "help us" piqued my curiosity in relationship to my interests in collaboration with the actant Photoshop, so I took a screen shot and continued on with the demonstration.

The translation of crowdsourcing brings another facet of the collaboration with the actant Photoshop, because my thinking on collaboration with Photoshop had thus far been dealing with the output of Photoshop: the images, graphics, animations as collaborations. In other words, my ideas had circled around what

you do with graphic design software to co-construct digital visual culture, but what this translation puts into motion is what you do to co-construct the visual technology itself. From the “help us” invitation of the opening dialogue box, there appeared a possibility for users to contribute ideas that are vetted by Adobe developers in moving the software forward in its functionality and engineering: users collaborating on the technology side and not just the output side.

It also brings in the issue of who the user is really collaborating with when using Photoshop. In this example, and indeed in using Photoshop to make images, the collaboration is framed with a visual technology, the ANT symmetry so important to this research, but the collaboration could also be framed as a once-removed collaboration with the developers, engineers, and programmers at Adobe. What does it mean to collaborate with a visual technology, the corporation that deploys it, or the developers that design it? Collaboration is not always a positive thing, but I have used it through out as a beneficial concept as it means generally in educational scholarship, but what are the dynamics of a collaboration with a corporation and what is being learned?

After class I went back into the computer lab and opened Photoshop again, and under the Help menu selected to participate in the Adobe Product Improvement Program. This time I clicked the “Yes, Participate” button. Another dialogue window pops up, from which I made the following selections, and clicked “Done” (see Figure 6).

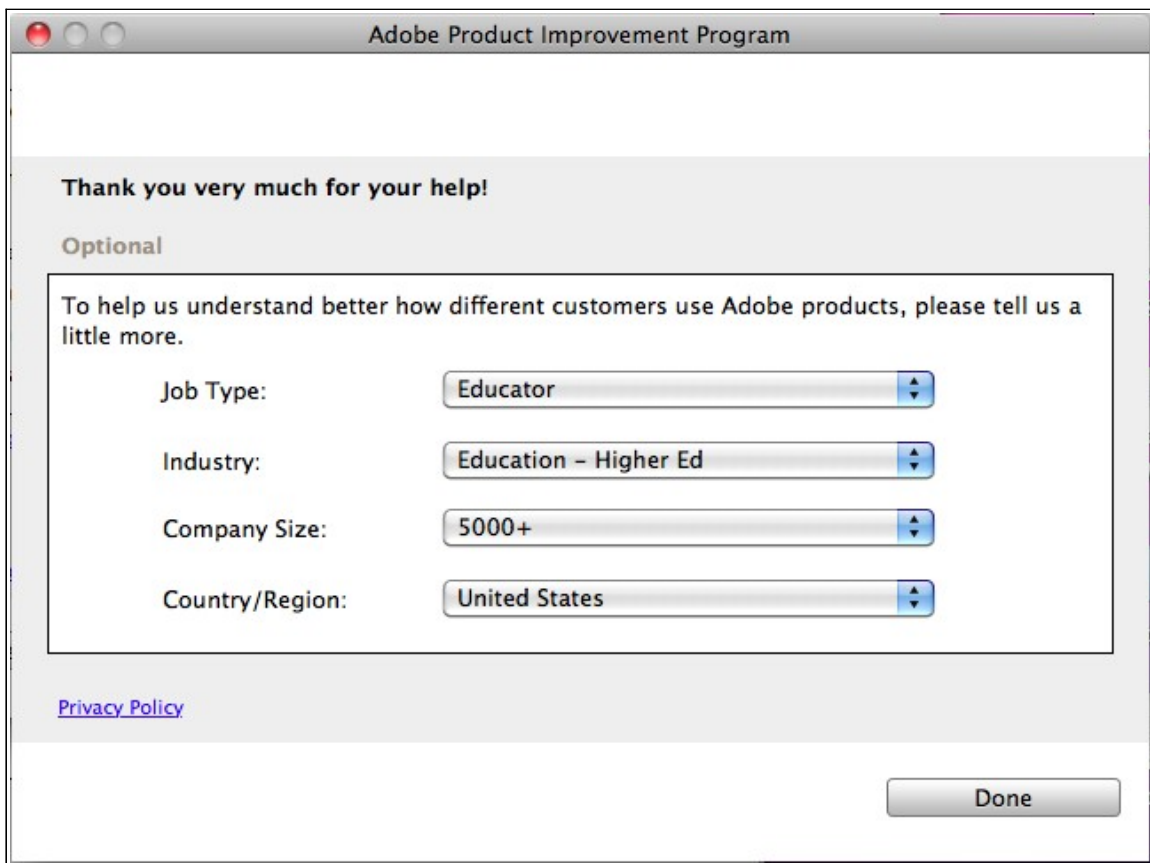


Figure 6. Screenshot of the Adobe Product Improvement Program third dialogue window.

The window disappeared and that was it. Nothing else. I reopened the invitation window and clicked the “More Information” link in the invitation window and it sent me to the Adobe Product Improvement Program (Prerelease) FAQ webpage.

(Adobe, 2011f). The webpage tells me that Adobe is going to track which buttons I use, which browser I use, my operating system, etc. It states:

How does the Adobe Product Improvement Program work?

This is an automated program that requires minimal effort to participate. Customers simply choose to participate, granting Adobe permission to collect data through your Internet connection. With participation, a small configuration file will be downloaded to your computer from time to time. The purpose of this file is to update the configuration of the data that is collected. (n.p.)

I do not need to do anything besides use the product and let them into my operating system to install spyware: allow small applications to be installed on my computer to collect information about my user habits so that it can be collected in a database of users that will be processed by Adobe, a corporation that "continually strives to understand and anticipate customer needs in order to deliver world-class products and solutions" (Adobe, 2011f). My field journal states:

This is a rather anemic collaboration compared to say the GIMP open source project, but still it is the same idea. You contribute ideas that are vetted by Adobe developers in moving the software forward in its functionality and engineering... However, this is a weak form of collaboration: you remain anonymous, there is no feedback for your contributions, and certainly no credit as Adobe will surely monetize on your ideas without credit being given. (March 30, 2011)

The translation of crowdsourcing and Photoshop was morphing from one of an invitation into the process of co-constructing Photoshop as a visual technology, i.e. the "help us" invitation, to a more anonymous contribution of data that made the collaboration more "anemic" than I had at first hoped. What at first appeared to be the translation of crowdsourcing was now entering into translation with data surveillance and spyware. In midst of the translations of crowdsourcing, data surveillance, and collaboration, my field journal entry for the day ends with the following question: "Is data surveillance, even when voluntary, collaboration?" (March 30, 2011).

mostly connected to free tutorials or lessons online. Another use of the term free is in conjunction with free downloads. Downloads are listed for brushes, plugins, actions, and layer styles and many of these appear in the search results as “free downloads.” There are many sites that offer downloads to extend the capabilities of Photoshop through third party designed elements.

An anomaly amidst these results is the website *PSD: Photoshop Disasters* (n.d.), which is a visual blogging site that showcases failures of photoshopping in popular culture as opposed to learning how to succeed with Photoshop, which is so prominent in these search results. *PSD: Photoshop Disasters* is an anomaly in a similar way as the inclusion earlier in this chapter of free and open source software as a node of translation: it is a singular result that highlights the exact opposite in translation than the majority of the results. The stark contrast of the focus of *PSD: Photoshop Disasters* as a showcase of image manipulation failure as opposed to its mastery makes it a mediator in translation with Photoshop as an image manipulation software and its broader verb usage that indicates “photoshopping” as an image manipulating practice. The blog administrator Psdisasters (2010, November 17) states:

Welcome to PSDisasters.com – A website showcasing terrible Photoshop from various kinds of digital and printed media.

Here at Photoshop Disasters (PSD) we strive to present the best of the worst Photoshop. How does this happen? It starts with having a meticulous community of readers who endeavor to catch and find these disasters. Every day countless disasters are emailed to PSD but only a few go on to become true Photoshop Disasters. (para 1, italics in the original)

The administrators of the website curate the various submissions from the “meticulous community of readers,” and then post the image along with certain tags. This structure of submission is another form of crowdsourcing as the community of readers scour print media in popular culture to find photoshop failures, which again brings back a new iteration of that translation with the Photoshop actant.

The tags are defined on a webpage (Psdisasters, 2010, December, 29), and are of particular interest to understanding the curatorial choices that Psdisasters makes in selecting reader-submitted images. In the blogging environment, tags are usually determined by the poster of the content, but the structure of *PSD: Photoshop Disasters* is somewhat different as submissions are processed through a central administrator who not only decides what will make it on the website, but what tags will be used to mark the posts. It is difficult to determine whether the prevalence of tags is related to the particular interests of Psdisasters as chief administrator and curator of the blog posts, the content themes that the community of readers tend to submit, or glimpsing the emergence of a Photoshop visuality. However, the inability to disaggregate these possibilities make them all a part of the gathering of translations that marks the content of the *PSD: Photoshop Disasters* website.

In looking more closely at the tags that are used, there are three themes that start to emerge through the word cloud visualization (see Figure 8).



Figure 8. Word cloud visualization of PSD: Photoshop Disasters tag website page.

The first of the three themes is one directly addressing the central focus of the website: presenting “the best of the worst Photoshop” (Psdisasters, 2010, November 17). Terms such as *ineptitude*, *crap*, *badly*, *inadvertent*, *problems*, *mistakes*, *unfinished*, *obvious*, and *bad* generally reference this theme. The second of the three themes is the role that Photoshop plays in changing images through both compositing and/or retouching images. Generally, compositing involves integrating parts of multiple images into a believable single image similar to the process of collage, and retouching is the process of editing an image by adjusting visual characteristics such as color, contrast, or shape. Terms such as *comping*, *comped*, *retouching*, *re-used*, *composition*, *removed*, and *shopped* generally reference this theme. Related to this theme is the issue of the market-driven contexts of the original source material, and the related legality of

image copyright that enters into the role of images being manipulated using Photoshop. Terms such as *photography*, *watermark*, *estate*, *catalog*, and *celebrity* belong in this theme. Additionally the term *ralph* belongs in this category, but it is difficult initially to understand why. Apparently, images from a Ralph Lauren ad campaign that show a female model whose torso and pelvis are impossibly small were posted on the *PSD: Photoshop Disasters* website as failure of retouching. As a result, Ralph Lauren issued a Digital Millennium Copyright Act (DMCA) take down notice to the website, along with other websites posting the photoshopped ad (Doctorow, 2009, October 6), which created attention and Internet traffic for the *PSD: Photoshop Disasters* website and a debate about copyright laws and fair use of visual images entered into translation with Photoshop and the practice of image manipulation known as photoshopping. The last of the three themes references the types of images that are being used in Photoshop. Subject matter is listed as predominately preoccupied with the human figure through such terms as *people*, *hands*, *hair*, *bodies*, *heads*, *person*, *faces*, *smiles*, *fat*, and *belly*. By connecting the idea of retouching with the compositing of images in Photoshop through photoshopping the human body that is handled badly it is no surprise that the term *frankenstein* is one of the more prominent words in the visualization. This translation of mutilation and monstrosity associated with frankenstein not only bonds through translation with the actant Photoshop, but with practices of collaboration or what can be called photoshopping.

NODE: Cloning Invisibility: Photoshopping Woman from History

Collaborations with the actant Photoshop framed through the practice of photoshopping are an important mediator in the translations found in the discourse body of the blogosphere evidenced by the crowdsourcing at *PSD: Photoshop Disasters* website, but also by the visual culture of news media. A particularly good example of this involves the visual culture surrounding the killing of Osama Bin Laden in May 2011, which dominated news media in the US, especially the blogosphere, and showcases the translations of photoshopping. The translations of photoshopping has circulated around the now iconic image of President Obama with his national security team in the Situation Room during the moments of the operation in Pakistan (see Figure 9).



Figure 9. President Obama and the national security team in the Situation Room.

An official White House photo taken by Pete Souza (2011) shows the intense gaze of the President, his highest military and secret service advisors, and cabinet members as they watch the unfolding events. Almost instantly, the image has become a part of a visual lexicon of US military power and diplomacy in the 21st century. However, the historical importance of this image or its implications as symbolic of international diplomacy for the US in the 21st century are not what brings Photoshop into translations with the visual culture of this event, but rather as blogger Xenia Jardin (2011) states “many photoshops will bloom” (para 2) as the image was circulated as a visual meme.

The circulation of the image through the White House website (whitehouse.gov) and the official White House Flickr photostream reached a

fevered momentum as the event itself raised emotions within the nation and as it was taken up as an Internet meme. The term “meme,” introduced by Richard Dawkins (1976/1989) in *The Selfish Gene*, is a concept that encapsulates the role of evolutionary forces in ideas. According to Dawkins, the Darwinian theory of natural selection coupled with the scientific research surrounding DNA had produced the gene as a replicator of biological characteristics that could not account for the cultural evolution of ideas. Dawkins (1976/1989) states, “we need a name for the new replicator, a noun that conveys the idea of a unit of cultural transmission, or a unit of imitation,” and he abbreviates the Greek term of *mimema*, which means “something imitated,” to the term “meme” (p. 192). Dawkins' work led to a field of study known as memetics that has diverged into research surrounding cultural evolution (Blackmore, 1999), religion (Lynch, 1996), and empirical method in the scientific study of memes (Aunger, 2000). The field of memetics has also been criticized for its “pseudoscientific dogma” (Benitez-Bribiesca, 2001) and as a misidentified theory of semiotics (Deacon, 1999). The viral quality of the meme as a generative evolution of ideas is a part of the translation of photoshopping.

In popular culture and the information flows of the Internet, a meme has taken on the character of an image, video, or other form of multimedia that is referenced and recontextualized repeatedly across websites and social networks by users inscribing new content onto and into these media forms. With each new manifestation of the meme, meaning is repurposed to create comedic, political,

and or dramatic effect. Through websites such as memegenerator.com, there actuates a nexus of images that users can write upon with different voices of commentary and play. Certain memes take on explosive popularity, gaining momentum through their wide proliferation and repeated use across the various mediascapes that the Internet provides. Thus was the occasion of the Situation Room meme, and Xení Jardin's (2011) blogpost presents several variations of the original image that mix it with other popular Internet memes.

In addition to the circulation and remixing associated with the Situation Room meme, there was another translation of the actant Photoshop involved with this image. On May 5, 2011, Shmarya Rosenberg (2011) of the blog *Failed Messiah* posted about the removal of Secretary of State Hillary Clinton and Director of Counterterrorism Audrey Tomason from the photo in the Hasidic newspaper *Der Tzitung's* edited version of the picture (see Figure 10).



Figure 10. Image taken from blog *Failed Messiah* illustrating the Hasidic newspaper *Der Tzitzung's* photoshopped version of the picture with blogger Rosenberg's annotations (Rosenberg, 2011).

This type of image manipulation can be handled with a tool in Photoshop known as the clone stamp tool, but Photoshop is not the only graphics software to offer this type of manipulation capability. It is important to note for the translation that Rosenberg classifies the particular image manipulation practice as photoshopping when he characterizes the image in Figure 9 as the “photoshopped version” and as the “photoshopped picture” (Rosenberg, 2011, para 1). It is unclear whether Rosenberg has first-hand knowledge as to the image manipulating software that *Der Tzitzung* used to accomplish the erasure, but the translation of photoshopping is involved through his characterizations and

the viral quality with which this story was taken up.

Rosenberg's highlighting the erasure of these women in this significant historical document was picked up by larger media outlets and became an equally pervasive news item surrounding the circulation of the image. Internet news website *The Daily Beast* (2011) posted an entire media gallery devoted to the theme, "Ultra-Orthodox Photos" (para 1), which includes the erasure of women from Israeli cabinet photos, girls from a school event photo, and former First Lady Laura Bush from a publicity photo from her 2008 visit to Israel. The copy for the first slide within the media gallery posted by *The Daily Beast* (2011) states, "this isn't the first time the ultra-Orthodox have run into controversy over fun with Photoshop" (para 1). Again, *The Daily Beast*, like Rosenberg, draw the actant Photoshop into translation with the visual culture of this event and other events through the cloning invisibility that collaborations with Photoshop enable. The claims to modesty for the representation of women within the policies of Orthodox newspapers and their publications did not quell the outcry, and the Photoshop actant has, through translation, joined as a collaborator in this erasure.

In addition to the objections of the erasure of the women in the image, Rosenberg (2011) also brings Photoshop in translation with the copyright protection of images similar to the translations found in *PSD:Photoshop Disasters*. Not only is the political and social significance of the erasure important, but the official White House image (Figure 9) is only released for use by news organizations and personal use under the condition that the image "may

not be manipulated in any way” (The White House, 2011, para 2). The manipulation of the image conducted by *Der Tzeitung* is clearly in violation of copyright in this regard, and Photoshop is again in translation with the issues of copyright and image manipulation.

NODE: Histochemical Seeing: Photoshop and Scientific Visualization

Seven out of the first ten results in the Google Scholar search results present a mediator in translation with Photoshop with its strong themes in the use of Photoshop inside of the medical industry. This translation, evident by the high ranking of these search results, is further indicated when terms such as “breast” and “liver” are prominent enough in the search to show up in the word cloud visualization along with the other medical terms such as “histochemistry” (see Figure 11).

enough for light to pass through it to illuminate cell structures. When cell material cannot be sliced thin enough for light to pass through, then histochemists must be prepared with certain methods of evoking coloration to distinguish cellular structure under magnification, and use of Photoshop has become a part of these methods. William H. Heidcamp (1995) states:

Selection of the correct procedure depends on what the cell biologist is looking for and to a point, becomes an art form. The histologist must choose among hundreds of procedures to prepare tissues in a manner that is most appropriate to the task at hand. (para 1-2)

Photoshop is used in coordination with these methods to help visualize cellular structures for purposes of diagnosis in body organs as diverse as the liver and breast. Histochemistry is the analog process of slicing the organic matter and dyeing or bonding in fluorescence to help see the thing under investigation, and Photoshop is used to further augment the analog attempts to differentiate cellular structures. As Heidcamp (1995) states this process of histochemistry is an “art form” in that the matter of sample preparation relies on the histochemist selecting methods from a variety of approaches to get the best results; the best results being the manipulation of the cellular material that makes visible the agential substance or structure that is being sought out. It seems very clear that the same tissue sample can be manipulated in different ways to illicit different visibilities related to different diagnostic purposes. The use of Photoshop appears to be in conjunction with these efforts to illicit visibility, but one that takes place within the Photoshop manipulation techniques and not under the

microscope.

The seven high ranking Google Scholar search results characterize Photoshop as a useful tool growing in popularity to scientific visualization practices in histochemistry. Upon closer reading of the articles from these seven results, a similar work flow is common to all: histochemical treatment of the tissue sample, digitized image of that sample, and then use of Photoshop to augment/enhance the visualization. Photoshop's contributions are characterized in several key ways. First, it increases the ability to quantify particular cells through image analysis by using the histogram to count pixels of the image (Lehr, Mankoff, Corwin, Santeusanio, & Gown, 1997; Matkowskyj, Schonfeld, & Benya, 2000). The histogram counts how many pixels are a certain color and then can be compared to the pixel dimension for percent coverage. Second, Photoshop allows for greater control over coloration effects through manipulating the RGB channels and hue saturation controls (Lehr, Van der Loss, Teeling, & Gown, 1999). Third, the ability to script processes into what are called "Actions" in Photoshop allows for a greater objectivity to image analysis and handling (Dahab, Kheriza, El-Beltagi, Fouda, & Sharaf El-Din, 2004). All of these steps are automated within the Action commands of Photoshop so that as Dahab (2004) states the "method is fully computerized with no manual interference at any step, and thus could be very dependable and reliable for objectively quantifying any pattern of fibrosis in liver biopsy sections" (Conclusion section, last paragraph). There is a sense that Photoshop is a trusted tool, or what I might call collaborator, for quantification to scientific visualization, because of its advanced capabilities to manipulate images via automated adjustments so that they can be

applied without subjective interjection.

Many of the medical entries in the Google Scholar results deal with the issues outlined above: utilizing Photoshop in a method to augment histochemical samples in medical visualization involved in diagnosis. However, there is one article that appears to take a more macro viewpoint on the ethical dimension of Photoshop's participation within this process. Rossner & Yamada (2004), as the managing editor and editor respectively of *The Journal of Cell Biology*, suggest in their opening line exacting what is at issue with the use of digital image manipulation in the medical imaging research: "it's so easy with Photoshop" (p. 11). Their argument is that the ease of digital image manipulation has translated into temptation, and that ultimately "many such manipulations... constitute inappropriate changes to your original data, and making such changes can be classified as scientific misconduct" (p. 11). The authors propose that good science relies on good data and that manipulation is an intrusion on the objectivity which is a hallmark of good data. For Rossner & Yamada (2004), "creating a result is worse than making bad data look better," and of course the accomplice to this scientific misconduct is Photoshop. Rossner & Yamada set out within the article to re-stage image manipulations that are from real cases that they then reenacted with Photoshop. However, no sooner than this simple outline of intent does their project become mired in the problematics of representation. Rossner & Yamada characterize the role of visualization in good scientific practice when they state:

If you misrepresent your data, you are deceiving your colleagues, who expect and assume basic scientific honesty- that is, that each image you present is an accurate representation of what you actually observed. In addition, an image usually carries information beyond the specific point being made. The quality of an image has implications about the care with which it was obtained, and a frequent assumption (though not necessarily true) is that in order to obtain a presentation-quality image, you had to carefully repeat an experiment multiple times. (p. 11)

There is the commonsense assignment of the image to observation where real science is only what you can observe, which contradicts theories of quantum physics and Niel Bors metaphysics that claim no phenomenon can be observed without interference (see Barad, 2007). In addition to this questionable issue of science and observation, there is the assignment of “honest” scientific practice with representation. The authors appear to want to have it both ways: scientific honesty understands that images tell more than you intend so you must only show images that represent what you have observed. This task is impossible, because each time the observer sets out to represent only what they have observed they are caught inexplicably in a web of representation that equates quality with truth. The quality of the scientific visualization of the cell tissue intimates through the representation of the image that the results were procured through building a solid record of scientific inquiry in turn building validity and rigor through the image not through the scientific practice. In light of this impossible equation of representation and truth, Photoshop starts to appear as a suspicious partner for its manipulation capabilities.

At one and the same time digital imaging is a temptation that may invoke scientific misconduct as the researcher using the seduction of images to garner support for their practice and a simultaneously a safeguard against malpractice.

As Rossman & Yamamda (2004) indicate, there are “advantages of the digital age to the reviewer and editor, who can now spot these manipulations” (p.13), because Photoshop is not only in translation with scientific practice but with the readership of scientific visual culture. The question is not in the absence of judgment, deleting or adding or manipulating to falsify results is clearly wrong, but rather the simultaneous juxtaposition between the visualization as truth and manipulation. Photoshop in translation with histochemical seeing creates a volatile field of visualization where images are proselytized and interrogated for their “immutable mobility” (Latour, 1986) or the attributes of visualizations as highly effective and complex communicators across space and time.

Rossman & Yamada (2004) begin their concluding section with an admonition:

Data must be reported directly, not through a filter based on what you think they [images] "should" illustrate to your audience. (p. 15, brackets are my inclusion)

And in the very next sentence they ask researchers to ask a question of themselves to determine what sort of manipulation should be conducted:

Is the image that results from this adjustment still an accurate representation of the original data?

These concluding remarks continue to swirl the tensions between truth and representation in scientific visualization, and the translations of Photoshop are continually present as the software is called out by name over and over within

the article. This article also indicates the multilateral effects of translation: Photoshop in histochemistry is in translation with scientific visualization, but the translation also doubles back as histochemistry itself is in translation as an objective “art form” through Photoshop. The translations of Photoshop and scientific visualization involve the makers of images in scientific practice, but also the perception of scientific visual culture as a readership in collaboration with the actant Photoshop.

NODE: Adobe Day at Ohio State University

My long-time relationship with Photoshop has been an enduring collaboration throughout this research process, and so when The Digital Union, a branch of the The Chief information Officer at OSU, announced an Adobe Day for their spring schedule it presented another opportunity to investigate the Photoshop GUI body. The Digital Union sponsors digital computing programming for faculty and students, and in the past I have been involved with sessions related to Second Life, distance learning, and the integration of Microsoft's cloud computing capabilities. As a part of Adobe Day, I signed up for the session called *Adobe Solutions for Higher Education: Image Editing Workflow*. The webpage for registration characterizes the session as a demonstration of “Photoshop for the beginner” (Digital Union, 2011). This “easier than you think” demonstration of Photoshop “you will be able to create artwork like a pro. If you leverage the tools in Photoshop correctly, then you will be able to tell your story more effectively and

with more impact. (Digital Union, 2011). A simple outline is given for the demonstration session and it states:

You'll walk away understanding how to

- employ Adobe Bridge as a way to manage your assets and access them quickly within Photoshop (or any other Adobe tool for that matter);
- move files from your digital camera through the best-practices workflow to ready them for use;
- manage files, and what file formats you should use when working with Photoshop;
- how layers allow you to create composite images like a professional—and how the tools for cutting an image out of a background work;
- create more than just an image with some of the automated tools for creating things like panoramas and web galleries with your images. (Digital Union, 2011)

The description of the session references image efficiencies, workflows, and professional standards. However, this business discourse of deploying Photoshop takes on a very different translation in the session (full recording of the session can be seen at <http://digitalunion.osu.edu/2011/05/17/adobe-day-at-ohio-state-0517-182011/>). The following is taken from my field journal that demonstrates the translations of Photoshop that thread through the image adjustment demonstrations. The juxtaposition of these descriptions of the session are not employed to over-determine what is possible in Photoshop, but rather to invoke some the translations that I encountered in Adobe Day beyond the session description.

The first translation that my field journal indicates deals with

photoshopping as a digital image manipulation practice. The presenter²³

mentions photoshopping as a consequence of the proliferation of digital images

in an expanding technological ecology. My field journal states:

This increased availability of digital images has brought Photoshop into popular culture (mentions "photoshopping"), but it also brings with it bad editing jobs. He remarks on the meme "it's been photoshopped. I can see the pixels" (see <http://knowyourmeme.com/memes/this-looks-shopped>) with a chuckle: kind of an insider's digital media joke because there is nothing else to see but pixels. So "everyone needs" easy editing capabilities. (May 17, 2011)

Photoshopping as a translation erupts into all the associated translations that

have been seen in other nodes such as the retouching effects, copyright issues,

and failure of using Photoshop convincingly. My field journal states:

After referencing the need to composite images, he then states "I'll let you figure out the ethics" which is definitely a nod to the problematic of retouching and proceeds to frame his entire image compositing exercise on a made-up story that the woman (of course it is a woman) in the image needs an alibi for getting caught jaywalking. He uses this as a humorous trope throughout to set the audience at ease, but the irony is stark. (May 17, 2011)

This presenter's joke sends Photoshop into translation as the suspicious

conspirator that were a part of the translations of histochemical seeing. The

ethical issues of image manipulation practices are framed as a user beware, but

the market territories of images and their value potential is inscribed with

certitude when the presenter demonstrates how to incorporate a copyright into

the metadata of each image you download to your computer. My field journal

states:

As Tim says "I copyright all of my photos, why not?" And then he goes on to jokingly suggest that that way if a wealthy person uses his image he can

²³ Timothy Plumer, an Adobe employee, conducted the session.

get money from them. (May 17, 2011)

This territoriality of the Photoshop translation within market relationships is also reintroduced through the language of the insider/outsider that continually a part of the demonstration. Assertions of “working like a pro” are a constant rhetoric of the presenter's monologue, but Photoshop is never far removed from this status.

My field journal states:

He keeps using phrases like "letting Photoshop do that for me" and "before Photoshop recognizes what I'm trying to do" indicating the agency of Photoshop in the editing process and also his willingness to be in collaboration with the software. However, at the same time there is the notion that he is the expert and that Photoshop and the audience for that matter are his subordinates: keeps referring to himself as a “guru” as in "if you want another guru tip." (May 17, 2011)

No amount of guru tips or insider knowledge can cement Photoshop's constitution, but yet through repetition a heterogeneous Photoshop emerges: the re-appearance of retouching, of copyright, of image editing automation, of market forces and the insider/outsider status of users in collaboration with the actant Photoshop. The agencies of the actant Photoshop flow through its network formation and in translation stitch together the actor-network through emerging consistencies of translation: the realization Photoshop's virtual potential as a collaborator.

NODE: 32 to 64-Bit Transition: Photoshop Future Tense

The multilateral dimensions of translation are evident in Photoshop when

considering the broader impact of innovation in digital computing, and I found this out when the mediating forces of the transition of desktop computing from 32 to 64-bit technologies erupted translation during one of my Art Education 252 class sessions. I was watching a student work in Photoshop CS5 at the end of an in-class work session when I had a suggestion for them to use the Lighting Effects option under the Filters menu. This is an image manipulation in Photoshop that can cast artificial light inside of an image to create a new light source or a more dramatic one. However, when the student went to the menu that I indicated had the Lighting Effect option the filter was gone. For one moment there was a disruption to the GUI body, an instant where my own insider translation with Photoshop became fragile. After some further investigation, it turns out the Lighting Effects option is not available in Photoshop CS5, but even more strange is that it is only available in the 32-bit version of Photoshop CS5.

Over the past decade there has been an industry-wide 32 to 64-bit transition that is happening with chip sets, operating systems, and software for computers. I say transition because it is not a coordinated effort rather a processing chip is capable of running 64-bit and then the software needs to be 64-bit and so on. Adobe has hesitated on this transition mainly because their market is the consumer desktop, but with the release of CS5 they have their first 64-bit version of Photoshop on both operating system releases²⁴. However, this is the first time that I have run into this sort of thing: the Lighting Effects filter has been taken out of the software but is still available if you run the 32-bit version. This unusual engineering propelled the bit transition and Photoshop into

²⁴ There was a release of a 64-bit version of Photoshop CS4 that was only for Windows.

translation when I looked befuddled over the student's shoulder to where the filter used to be located, but the insider/outsider translation that I had encountered through the Photoshop publishing industry, on Adobe Day, and in the constellation of Photoshop branding was now in my classroom: this time the student and I were in translation with Photoshop and the insider (me)/ outsider (him) had come to pieces. Upon further investigation I found out that a user can manually designate Photoshop to open in the 32-bit version, and then when it is opened the Lighting Effects is there under Filters as always (see Adobe, n.d., Add Lighting Effects).

In writing my field journal entry for that day's class session, the translation highlights an unusual solution by Adobe and caused another opportunity for me to encounter the GUI body of Photoshop through the sites of innovation. However, if this was innovation, I would need to understand what was the advantage with the 64-bit environment in order to require this type of engineering of CS5 between both 32-bit and 64-bit. Adobe (2011a) acknowledges that there may be some differences in operating speeds with the 64-bit environment, and estimates a 8-12% increase in operating speeds. However, the "primary advantage of using the 64-bit version of Photoshop CS5 is to access amounts of RAM beyond what Photoshop can access as a 32-bit application" (Adobe, 2011a, para 7). This means that Photoshop can take advantage of more than 4 gigabytes (GB) of random access memory (RAM) only when it runs as a 64-bit application. If you use files large enough to need more than 4 GB of RAM, and

you have enough RAM, all the processing you perform on your large images can be done in RAM, instead of swapping out to the hard disk. If there is a better use of larger RAM resources this may equate with faster processing speeds, but that is not always the case (see Berardi, n.d.). Instead, it seems that the reason beyond the minimal processing speed advantage is that there may be on the horizon a need for more RAM, more bits, and the potential for greater processing speeds. The bit number related to Photoshop has only a moderate amount of processing advantage and an unforeseen advantage when the consumer and the industry catch up to it. There is no need for 64-bit, but it is possible and so the mutation takes shape to see what it shapes. Photoshop is then in translation with the ways of digital chimeras: they change sometimes without intent in mind, but only possibility. Industry is capable of engineering a 64-bit operating system and software even though the consumer does not need it nor will they use it.

So more bits are not always an advantage, but why did Adobe do away with the lighting effects and how is it related to this transition of 32 to 64-bit in Photoshop? Lighting Effects is not the only 64-bit problem (see Adobe, 2011g), but it is the first effect of the transition felt in my classes. And it turns out that I am not the only one asking these questions. There was a lively discussion about the missing feature due to the 64-bit upgrade on the Adobe Support Forums involving a mix of consumers and Adobe employee Chris Cox (John_Nolan, 2010, May 9). Cox explains that the CS5 64-bit release does not come with Lighting Effects, and it will not be included through an update due to two reasons 1) the burdensome nature of updating the source code and 2) because of the regulatory nature of the Financial Accounting Standards Board (FASB) and "revenue

recognition problems” (Cox, 2010, May 20). Cox states:

In a nutshell: We can't add functionality after we ship without charging more for it (at least not without changing half our corporate accounting and scaring investors, or running afoul of accounting standards, auditors, regulators, etc.).

FASB changed rules several years back to try and halt bad practices by a few software vendors, and ended up hurting everyone else in the process.

This lights up a really interesting thread concerning Adobe's need to address customer needs and regulation versus choice. Cox seems to suggest that Adobe would do all they can if their hands were not tied by accounting regulation, but folks on the thread find this explanation to be scapegoating regulation when in fact it is a business decision by Adobe. Several users reference Adobe's market dominance, the inconsistency in this statement in relation to other software releases, and the status of the decision as a choice not as a matter of fact (John_Nolan, 2010, May 9). Cox's empty corporate speak about satisfying customers instead of addressing choices made by the Adobe corporation does not appear to satisfy the reason for the missing Lighting Effects filter, and the larger issue of making the transition to the 64-bit version are not addressed. What started as a moment of confusion in my class on where the Lighting Effects Filter has gone erupts Photoshop into translation with innovation and computing trends, accounting practices, and customer relations.

NODE: Photoshop Semiotics: Theory and Practice of Photoshop in Art Education

Very little in the results of the Google scholar, Google web, and OSU Library searches conducted to explore the discourse bodies of Photoshop presented translations with the academic discipline of art education. Throughout the various search results there is plenty that focuses on learning, books, tutorials, and techniques, but very little that attends to the academic pursuits of curriculum theory and instruction, ethnographic field study, or visual culture studies critique that have been the hallmark of much of contemporary qualitative research within the field of art education. There is one notable exception: Micheal Emme and Anna Kirova's (2005) "Photoshop Semiotics: Research in the Age of Digital Manipulation." This article is the singular example of Photoshop in translation with the academic pursuit of theory in the field of art education that came as a result in these search methods.

Emme and Kirova's article is an exploration of digital image manipulation and its relationship to educational research. Their claim is that the uncertainty of digital images is a continuation of the trajectory of and investigations of the lens that continues to problematize relationships of representation and truth. The practice of digital manipulation in images is likened to practices of collage that tease out tensions between fragmentation and universalized meaning, and therefore a potential for use in researching meaning-making within educational settings either as a method or as a process of production for participants i.e. students. This sort of meaning-making within the contingencies of perceived real and fake passages of the photographic practice presents rich sources of data for

what Jewitt and Oyama (2001) have called a “social semiotics” in educational research. Emme and Kirova (2005) describe the digitally manipulated image as a “form of collage that has been built out of photographic parts using digital glue and scissors. As such we can read each part for the meaning it brings into a final composition that brings together multiple, sometimes contradictory stories” (p. 149). Within this thesis, Photoshop is positioned as the preeminent software program that epitomizes this type of digital collage of meaning. As Emme and Kirova (2005) state:

Specifically, in looking at the technologies of image manipulation epitomized by the ubiquitous software Adobe Photoshop as it can serve the researcher, it is important to consider the science of the semiotic and the poetry/philosophy of the hermeneutic in discovering how manipulated images can introduce a productive uncertainty as knowledge. (146)

There is also attention by the authors to the network formation of Photoshop, although they do not use this terminology when they mention in a footnote that the term Photoshop references not only a brand, but a “collective noun, (and maybe a verb)” (p. 151). Without the language of an ANT methodology applied in the article, I infer this reference to be a smaller scale of the task I am undertaking in reassembling the data into the actor-network of Photoshop. However, one important difference is that Emme and Kirova are focused on a practice of photography of which digital manipulation is but a chapter, and my focus centers on the actant Photoshop. Even though Photoshop is acknowledged as the “epitome” of this practice, it could have just as easily been another software program.

In order to evoke the translations of Photoshop within the discourse body of art education, beyond the one result of Emme and Kirova, it was required to work the search in a much more strategic method to yield data that would showcase the translations of Photoshop and the academic discipline of art education. This method involved keyword searching specific academic art education journals: *Studies in Art Education*, *Art Education*, *Visual Arts Research*, and *Arts & Activities*. As a result of this more strategic searching focused on art education I located four articles from *Studies in Art Education*, nine articles from *Art Education*, nine articles from *Visual Arts Research*, and nine articles from *Arts & Activities* that mention Photoshop specifically in the text. Of these thirty one articles, Photoshop is characterized overwhelmingly for its instrumentality in an artmaking process: as a “material” (Arthur, 2008; Mahon, 2009; Mathes, 2007, 2009;) as a “tool” (Osterer, 2006, 2007) to scan drawings into the computer (Carroll, 1997; Keifer-Boyd & Kraft, 2003; Sartorius, 1998) and enhance or manipulate digital photographs (Keifer-Boyd, 1996; Shin, 2005). Most often these uses of Photoshop are in reference to a student's use, but some authors did mention their use of Photoshop to create computerized instruction materials (Galbraith, 1996; Shin, 2005). A majority of the articles puts Photoshop in translation with technology integration within art curriculum, and many of the articles commented on Photoshop's digital collage characteristics: cut and paste techniques (Adams, 2005; Murphy, 2003), working in layers (Gude, 2004; Winters, 2009), and as a form of collage (Emme & Kirova, 2005; Hutzel, 2007; Patton, 2005). Oftentimes, these analogies to collage are in reference to a postmodern framework where the emphasis is more on interpreting

representation, modes of appropriation, and engaging contemporary art practices: Photoshop is posed as a tool in translation with these types of artmaking processes and can reflect these meanings (Emme & Kirova, 2005; Gude, 2004; Keifer-Boyd, 1996; Wilson, 2003). Other times these digital capabilities are in translation with expanding the art curriculum to investigate forms of new media (Arthur, 2008) and media education (Parks, 2005).

A final thread of translation for Photoshop within these articles is the role of the teacher and student in learning and teaching the software. This translation constructs a continuum between positions of the expert and novice in the process of using Photoshop. Some authors tend to position Photoshop as something a teacher can “simply add” to preexisting art lessons (Wilson, 2003, p. 224) or as “user-friendly and easy for students to grasp” (Murphy, 2003, p. 42). Instruction in these cases is usually supported through “step-by-step instructions” (Murphy, 2003, p. 42; also see Mathes 2007 & 2009). There is also a number of articles that appear to emphasize the ease of including Photoshop as each author mentions specifically that they were working with a full class of students and only one computer (Arthur, 2008; Mahon, 2009; Murphy, 2003). On the other hand, some authors position Photoshop as a more vast opportunity of image editing and learning the software is achieved through a “collaborative process” (Hutzel, 2007, p. 37) or “discovery learning” (Gill, 2009, p. 112). As David V. Gill (2009) states: “the teacher resisted taking on the role of an expert...but instead acted as a coach or guide, providing strategies and

suggesting resources when students encountered problems” (p. 112). This puts Photoshop in translation with not only its perceived uses in the art classroom and curriculum, but also in its role in pedagogy.

Adding a Node: Looking for the Visual in the Data

Up to this point, the data offered from the mediating agencies within the discourse body and GUI body of Photoshop have offered several visuals: for example, specific instances of images erupted in translation with Photoshop such as the image of the White House situation room photo and its meme iterations online in the blogosphere and have been shown in the data. There has also been an express use of data visualization as a method within the research: for example, the cloud visualizations to evoke mediators in discourse bodies of the data collection and the visualization of nodes presented in a network formation with the Photoshop actor-network. However, the use of images, a focus on the visual that is an express concern of this research, has remained an untapped resource in constituting the Photoshop actor-network. The process of reassembling the data through the discourse body and GUI body of Photoshop allows me to see that an important element in addressing my problematic, i.e. the primary research question, was fading from view. Although the ANT methodology is quite robust in the reassembling of the this chapter, the intersections of the theories of visibility begin to lose focus not because the notion of visualizing has not been addressed: indeed we see scientific visualization through the node of histochemical seeing, image manipulation practices of photoshopping in the node

of the Photoshop fail, and the erasure of women from the representations of history in the node of cloning invisibility. However, part of constituting the bodies of Photoshop, either through the discourse bodies or through the GUI body, starts to lose sight on the important notion of the “visual construction of the social” (Mitchell, 2002, p. 171) by not constructing methods of data collection that invoke the visual by its direct presence, not its reference, in the data.

In recognizing this deficiency in the methodology, I returned to the search process and used an image search instead of a web search or library catalog search using the keyword “photoshop” to generate the results (see Figure 12).

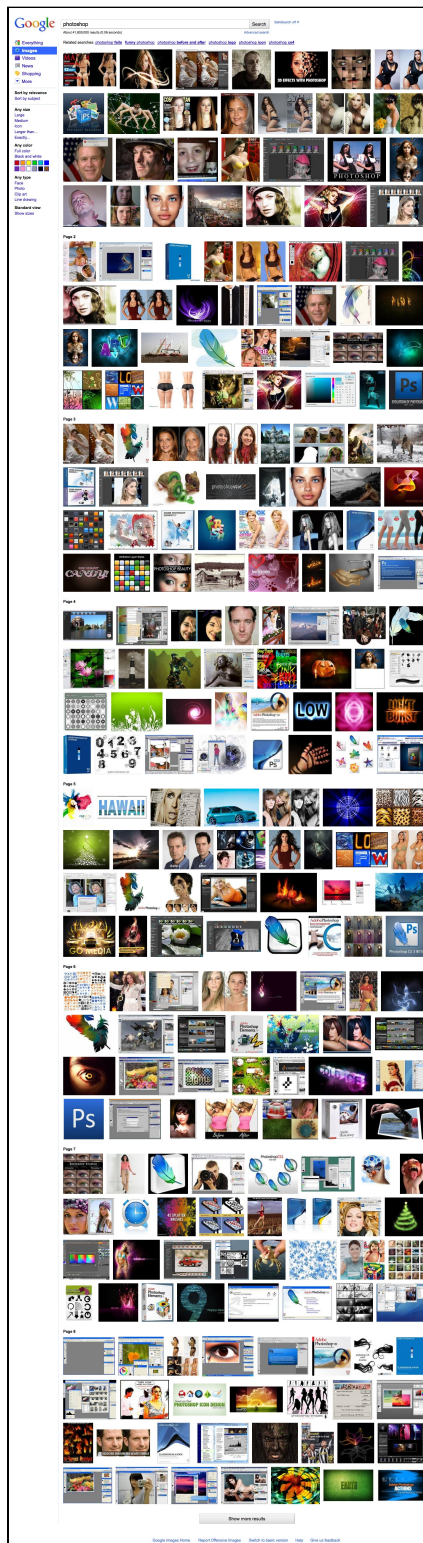


Figure 12. Google image search results for keyword “photoshop” conducted on May 21, 2011.

An image search looks for Internet graphic files that have keyword associations and collects the results into a visual display of these hits. I experimented with several image search engines, but ultimately decided to go with the Google image search for two reasons: 1) Google's search algorithms have been a significant collaborating actant in my data collection thus far, and 2) surveying the search results from other search engines, Microsoft's bing.com for instance, indicated to me that there would be little variation in the images returned. In looking over the results there are images that begin to enter into translation with Photoshop along many of the translations that were a part of the other nodes. The translations of the images are determined both through the visual content and through the short caption that is presented with each image in the search results. There are images that display examples of Photoshop fails through misproportioned or altogether missing body parts. Images of retouching effects that are almost always presented in a before and after composition where the unedited version of the images is placed side-by-side with the retouched results. Images from professional graphic designers that display a high proficiency with Photoshop effects. A large number of images are examples or screenshots taken from tutorials that invoke the crowdsourcing translation of Photoshop visual culture communities of makers. When taken together, both the images made by advanced Photoshop users and the tutorial images, these images begin to structure the insider/outsider translations found in so many of the other nodes. Another large collection of images references the constellation of Photoshop

products through various branding identity images, logos, screenshots of different software products, and advertisements for various innovations in the Photoshop universe. Finally, as there was in the discourse body there is also a small number of images that reference GIMP and invoke the free and open source alternative software translation. These image search results reiterate the rhizomatic intersections of translations of the ANT methodology that has provided the assemblage of the Photoshop actor-network in focus throughout this chapter, but through a visuality that constructs a social framework not a social framework that constructs a visuality.

Assembling the Translations

Throughout this chapter there has been an emphasis on constituting the Photoshop actor-network that emerges through a symmetrical interaction between myself and the actant Photoshop. As a core operation to this curation of accounts of these mediators, the ability of the mediators to enter into translation with the Photoshop actor-network, both in mediating the entity Photoshop and in folding back upon the various nodes in translation, it should be apparent at this gathering that translation is a multilateral phenomenon. Whether it is the constitution of the insider/outsider translation to leverage learning relationships through online tutorials or the serialization of how-to technical manuals showing users the down and dirty tricks of Photoshop, the Photoshop actor-network emerges as a rhizomatic formation of flows that move in multiple directions. Translations presented within the Photoshop actor-network not only fill with social

meaning understandings of the heterogeneous object that is Photoshop the visual technology, but they flow back into the nodes and partially constitute what it means, for example, to see in histochemical visualizations, what defines failure in certain online visual culture communities like *PSD: Photoshop Disasters*, and how the property lines get drawn onto visual actants within the actor-network of copyright law. Assembling the Photoshop actor-network relies on ANT theory as a “sociology of translation” (Brown & Capdevila, 1999), and it is the translations that fill the social meaning of the Photoshop actor-network in durable and fragile movements.

In light of the importance of the translations that are visible through the gathered nodes reassembled in this chapter, it is helpful to take stock of those translations before moving on to the following chapter of data analysis so as to understand the assemblage of translations that will enter into intersections with theories of visibility. The following is a listing of the nodes followed by listing the mediating forces of the translation with the Photoshop actor-network:

- **A Constellations of Software:** market forces, branding, photoshop users, novice, expert, insider/outsider, mobile computing, body interface, innovation, raster images, photography, 3D graphics,
- **Free and Open Source Software Alternatives:** free and open source, proprietary software, innovation, market forces, ethics, hacking, copyright, GIMP, insider/outsider
- **Down & Dirty Tricks:** insider/outsider, mutating publication, rapid release,

tethered software roll out, learning materials

- **Spyware as Collaboration:** crowdsourcing, collaboration, corporation
Adobe, data surveillance, spyware,
- **Photoshop Disasters:** tutorials, free stuff, photoshopping, failure,
crowdsourcing, compositing, retouching, market forces, copyright, human
body, frankenstein,
- **Cloning Invisibility:** crowdsourcing, photoshopping, memes, erasure,
invisibility, copyright,
- **Histochemical Seeing:** scientific visualization, visibility, quantification,
objectivity, ethics, representation, truth, analog vs. digital, suspicious
collaborator
- **Adobe Day at Ohio State University:** image efficiency, photoshopping,
ethics, retouching, compositing, copyright, suspicious collaborator,
insider/outsider, market forces
- **32 to 64-Bit Transition:** innovation, insider/outsider, market forces,
accounting practices, customer relations
- **Photoshop Semiotics:** postmodern representation, appropriation, social
semiotics, collage, teacher as expert, teacher as coach, instrumentality,
technology integration in art curriculum
- **Google Image Search:** failure, retouching, insider/outsider, experts,
tutorials, crowdsourcing, free and open source, branding, market forces,
innovation

These translations showcase a range of issues that erupt in the interactions

insider/outsider, market, copyright, photoshopping, ethics, innovation, crowdsourcing²⁵. In order to understand the formation of these translations as not unilateral or singular in their focus within the Photoshop actor-network, the dominant translations, more readily seen in the word cloud visualization, were used to create a graphic that shows the associations within and between the translations (see Figure 14).

²⁵ The word “forces” is also a larger word in the visualization, but is used in conjunction with market in the translations and is therefore left off of this list.

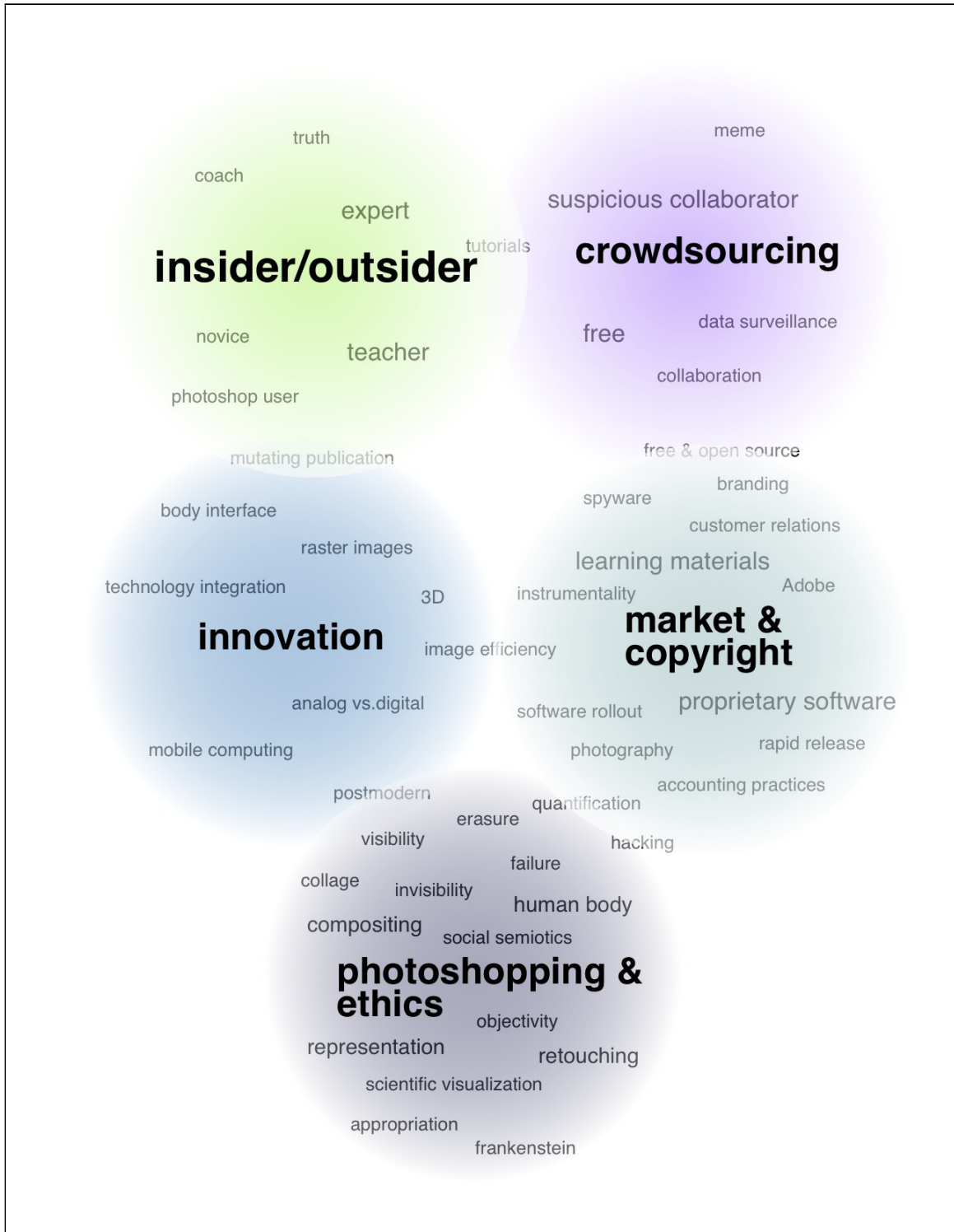


Figure 14. Visualization of the translations assembled in clouds of associations.

These formations of translations that locate associations of translations within the five dominant translations that emerge from the Photoshop actor-network will be used to implement an analysis that will begin in the next chapter to pull theories of visuality into the intersections of translation so that an understanding of a human-technological hybrid of visual technologies may be perceived. The translations are the residue of following the actant utilizing an ANT methodology to understand the translations that form around and through the heterogeneous Photoshop actor-network, and the task of the next chapter will be to continue the ontological framework that has brought about this rhizomatic formation and to bring to fruition the assemblage of a visuality that is “a time-based medium...[a] series of connected and dispersed lines, crossing time and space, [and] is a network. (Mirzoeff, 2006, p. 76).

Chapter 5: Data Analysis

Intersections of the Photoshop Actor-network and Visuality

The main research question asks to understand the human-technological hybrids in a social ontology through the intersections of ANT theory and theories of visuality from visual culture studies scholarship. The methodology of the study was constructed with theories of ANT that rely on a symmetry between human and non-human contributors to social interactions to form the network assemblage of translations that proliferate in the associations of these social interactions. The non-human contributor focuses on a visual technology, in particular for this research study the graphics manipulation software Photoshop, in an assemblage with the central human actant, myself as researcher, to gather the translations of our symmetrical constitution of Photoshop as an actor-network. Important to an ANT methodology is the recognition of the symmetry between Photoshop and myself, and the building of the Photoshop actor-network in the previous chapter was constituted through re-presentations of the most forceful mediators as nodes within the social assemblage. These mediators were

encountered through the data collection fields of the bodies of Photoshop, both the discourse and GUI bodies, my own visual-narrative field journal, and the further inclusion of images gathered from a Google image search. These mediating interactions were encountered through the sites of innovation, distance, accidents, and documents in both fragile and durable translations that rise within the research data corpus as the most forceful, and therefore significant, mediators within the actor-network. The data chapter was composed as a risky account of these rhizomatic transformations as the Photoshop actor-network emerged through the data collection of the research study. This chapter analyzes these translations within the intersections of ANT theory and theories of visuality to further develop the movements of interpretation through the technological ecology, digital chimeras, and network being. These three movements themselves emerge from my own background experience as a regular collaborator with visual technologies, a maker and teacher in digital visual culture, and my analysis of current trends within the digital media and learning scholarship, taken from the introduction chapter, that takes account of important shifts in learning spaces and subjects through the ontological framework so important to this study.

The use of the technological ecology, digital chimera, and network being are used here as theoretical movements towards ontological frameworks at work throughout this research study, and are suggested here as movements relevant to the shifting terrain of digital computing and network connectivity that have been theorized through other movements discussed in the introduction and literature review chapters: examples include movements such as convergence

culture (Jenkins, 2006), posthumanism (Haraway, 1991; Hayles, 1999), participatory culture (Jenkins et al., 2006; Rheingold, 2009), and the exploration of the generational significance of “digital natives” (Palfrey & Grasser, 2008; Prensky, 2001, 2006). However, the three movements introduced in this study provide a different emphasis of analysis that may be considered a part of the ontological turn (Escobar, 2007) taking place in the social sciences introduced by such examples as assemblage theory (DeLanda, 2006) that was discussed at length in the literature review.

The introduction of these movements is a shift in focus that accomplishes two ends: 1) it places a particular emphasis on ontological perspectives central to ANT theory, and 2) facilitates new theoretical spaces to grapple with potentially important contributions from visual culture studies, in particular focus for this study theories of visibility, that may impact understanding and participating in a ubiquitous digital visual culture. The need for these new theoretical spaces arises from the opportunities digital network computing present to understand the changes to “our values and norms surrounding education, literacy, and public participation” (Ito et al., 2010, pp. 1-2), addressing the “hidden curriculum” of a mutating digital divide (Jenkins et al., 2006, p. 3), and providing a needed focus on the visual that has been largely absent within the scholarship (Sweeny, 2010b).

The Photoshop actor-network has been constituted for this study through the nodes in the data chapter and the translations within each node that were

composed within the assemblage. These translations of the Photoshop actor-network were visualized through both a word cloud (see Figure 13) and collected under central translation themes (see Figure 14). In addition, the social ontology of the Photoshop actor-network was further made visible through the Google image search (see Figure 12). In order to pursue visualization as an opportunity for further analysis, I have constructed a visualization that attempts to show the relationships between three visualizations that come from the data of the previous chapter: 1) at center the graphic that represents the symmetry of actant participants, myself and Photoshop, of the Photoshop actor-network, 2) the translations assembled from the nodes of the data chapter into associative clouds, and 3) a curation of the Google image search results based upon the images in translation to the Photoshop actor-network (see Figure 15).

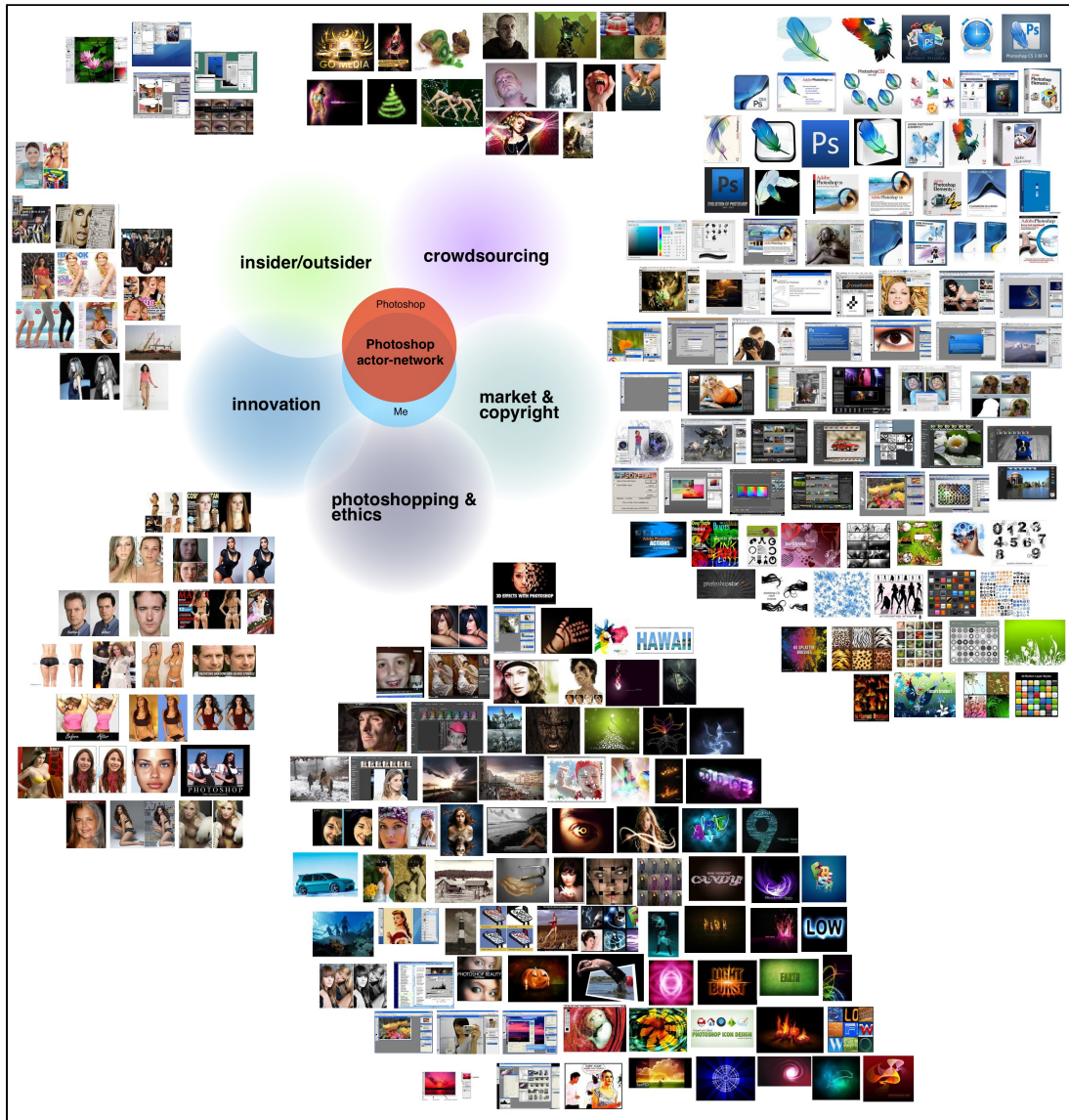


Figure 15. Photoshop social ontology utilizing the image search, translations, and actor-network

The Photoshop actor-network visualization above (Figure 15) is a culmination of the research data being re-assembled and is used throughout this chapter as it is referenced through the three movements of my analysis. The images from the Google image search were collected into arrangements that reflect certain

translations that are discerned from both the visual content and the short caption that accompanies each image in the search results. In curating the arrangement of image into these masses, I discerned six translation categories to configure the images:

1. Photoshop constellation: images that show Adobe software branding, promotional screenshots, software features, and add-ons to the software such as brushes.
2. Tutorials: images that show screenshots and final results of tutorials that deal with working with effects with text and manipulating digital photos.
3. Retouching: images that deal specifically with retouching as a category of photoshopping that focuses on the human body.
4. Fail: images that deal specifically with photoshopping in visual culture that is exposed as a failure.
5. GIMP: images that deal specifically with the free and open source software GIMP.
6. Expert: images that are examples of professional quality image manipulation.

These translation categories are shown in the following visualization (see Figure 16):

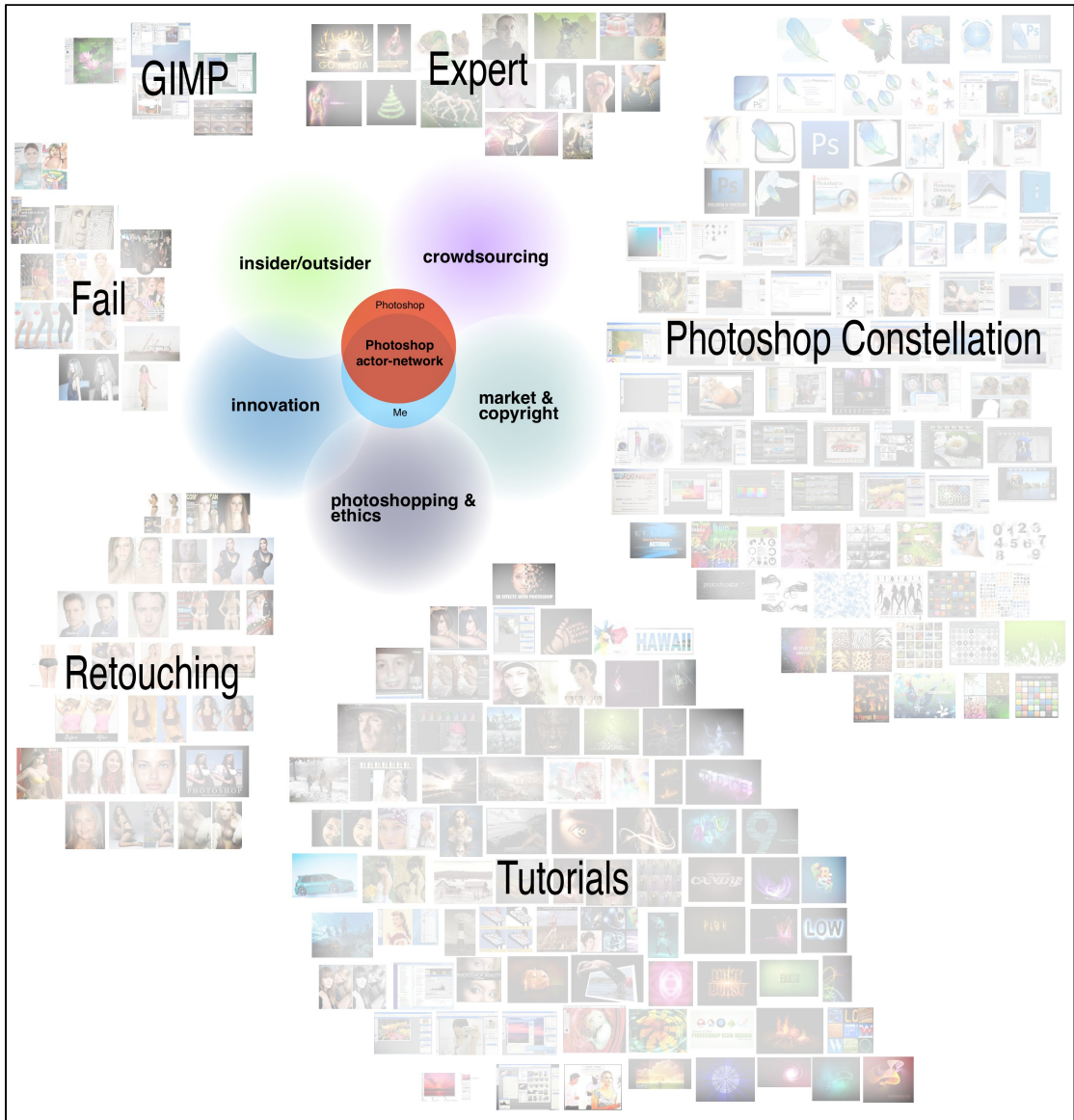


Figure 16. Photoshop social ontology with the translations overlaid onto the visualization.

The six translations present in the Google image search that were used to curate the images in Figure 15 are not new to the translations that were assembled through the nodes, but rather a reiteration through the visual construction of the Photoshop actor-network that further supports the presence of these translations

with the other components of the data corpus. For example, the image search shows a large amount of results that deal specifically with tutorials which relates well to established translations of crowdsourcing and insider/outsider that were present in several nodes. The visual presence of tutorials in Figure 15 corroborates these translations presence in such nodes as Down & Dirty Tricks and Photoshop Disasters. Again, this chapter answers the central research question: to bring the intersections of theories of visibility and ANT to analyze the social ontology of the visual technology Photoshop, and see understandings that it may bring to human-technological hybrids. Attention to the subquestions in the research will also be a task of this chapter. The first subquestion asks what does visibility offer to the social ontology in understanding human-technological hybrids, and this will be addressed at the end of the chapter. The second subquestion asks what understandings of the social ontology may offer to understanding participation in a network society, and this subquestion is also answered at the end of the chapter. In what follows, I will begin the data analysis by looking first at the technological ecology, then moving on to the digital chimera, and concluding with the network being before providing answers to the subquestions.

Movement of the Technological Ecology: Distribution of Resources, Modest Designers, and Sustainability

As was stated in the literature review, central to the concept of a technological ecology for this study is the notion of shifting resources that combine and recombine within a dynamic process of mutation, and not a rolling

out of paradigmatic shifts that insert teleological narratives into the process of history. Instead, technological ecologies must be seen as collections of entities that draw from one another, share, segregate, build, fall apart, and combine all at once. Important to the notion of the technological ecology is the combination of entities that appear to be from separate worlds, but rather in the ecology metaphor find translation and mutual constitution through network-like formations. The technological ecology is the foundation for a nature-culture visuality that does not parcel history from hardware or culture from software, but rather looks for the movement of resources that put these entities in translation. In this sense, the technological ecology can be seen as a meta-network of assemblages, a sort of macro scale of the many actor-networks that compose contemporary digital computing with many heterogeneous entities producing digital chimeras of a vast variety and with increasing momentum. If anything can be said to characterize the current technological ecology it might be the ever increasing speed at which it moves resources and builds momentum towards certain formations.

With this in mind, the focus of the technological ecology movement in this study is on the resources and formations surrounding Photoshop in its constitution in the data chapter as a software, brand, verb (photoshopping), and community of users. However, it should be kept in mind that this is but one assemblage within larger formations of assemblages that could also be brought into resource movements within the technological ecology through such

assemblages as operating systems, art and design worlds, material productions, and hardware devices. In order to maintain focus on the Photoshop assemblage, I will base my analysis on the central graphic of this chapter showing the visual construction of the Photoshop social ontology (see Figure 15), which correlates with the translations that erupted in the nodes assembled in the data chapter, to track the resource movements of the Photoshop assemblage through the technological ecology. There are two rather obvious entities that dominate the assemblage and generally characterize the ecology's overall character through its visual construction: 1) the constellation of Photoshop products and 2) the proliferation of tutorial websites.

Within the technological ecology of the Photoshop assemblage, the tutorial collection amasses more resources when considering that the collections of retouching, Photoshop fail, and the expert examples could be considered similar resources as the tutorials within this ecological configuration. The only resources within the visualization that sit outside of this dominant group would be the constellation of Photoshop and the collection of free and open source software alternative which are all focused on the GIMP program. These two dominant resource formations within the network, both the tutorial and the software, will be taken separately to understand how they both contribute to the understandings of the human-technological hybrid of the Photoshop actor-network.

Starting with the software collection of the network formation, there is an obvious emphasis on the constellation of Photoshop branding and software that was a significant part of the nodes in the data chapter. This is no surprise in that the nature of the data collection method of searching using keywords that are the

name of a major digital manipulation software would reasonably return such a visual construction, but same as the mediating agencies that erupted in the discourse bodies in the data chapter the presence of the free and open source software alternative, specifically four images referencing GIMP, still remains a part of the visual construction of the Photoshop social ontology. Analysis of the visual construction of the constellation of software provides certain characteristics to the types of resources that are available to the ecology: predominately there is a cohesive brand identity of Photoshop seen in both the Figure 15 visualization and in the constellation of Photoshops node from the data chapter. The presence of the brand strategy speaks to the involvement of the Adobe corporation as an invested entity within the ecology to the human-technological hybrid similar to the ways that Adobe was questioned as a collaborating partner in the node of spyware as collaboration from the data chapter.

Part of this corporate involvement determines a secondary population of products that populates the collection that are all correlated to the Photoshop software and take on its body both through the brand of discourse materials and the GUI. Examples of the discourse materials include the published books that invoke brand strategies and brand identities in marketing the applicability of the text to understanding and learning Photoshop as software. These secondary materials were seen in the data chapter as part of the Down & Dirty Tricks node that highlights the relationship of the publishing industry with Photoshop and its

deployment. Examples of the GUI include not only direct screenshots of the software in its separate incarnations of various Creative Suites or Lightroom, but also the presence of a parasitic population of add-ons and tool sets that can be configured within the Photoshop working environment. From special brush sets designed by other companies to sets of actions configured by other designers, these additional tool sets and resources are configured to be Photoshop specific add-ons that require the ecosystem of Photoshop in order to function. In fact, these resources are so much a combination of helpful and Photoshop specific that other graphic design software options, such as GIMP, have added adaptive capabilities to use the specific Photoshop brush format or convert the format to another one applicable to that software environment. The images from Figure 15 of these brush sets and actions made by third parties to work within the Photoshop software were also prevalent in the Google web search results that help to constitute the discourse body of the blogosphere. This further illustrates Photoshop as a collection of software entities, similar to the constellation of Photoshops node from the data chapter, but also as the central population within a larger software ecology that is nested within the technological ecology and demanding of its overall human and technological resources.

Conversely, a much smaller resource within the formation is the presence of the free and open source software alternative known as GIMP. Again, similar to its anomaly status in the discourse body discussed in the free and open source alternative software node in the data chapter, the presence of GIMP within the Photoshop assemblage indicates its relational status with Photoshop and is consistent with the character of ecologies as not always homogeneous or

rational. The resource of GIMP is a smaller entity within the technological ecology and has repeatedly been connected with the Photoshop assemblage both in Figure 15 and the nodes of the data chapter. Its presence indicates the resources that image manipulation software provide to users to enter into collaboration with visual technologies in the co-construction of digital visual culture, but also characterizes the nature of the collaboration that these resources and their formations afford to the user.

As a free and open source alternative software, GIMP aligns itself with a certain ethos of digital software development that is counter to the market forces of ownership that are central to the proprietary software concept. As the founder of the free software movement, Richard Stallman (2010) states “‘free software’ is a matter of liberty, not price. To understand the concept, you should think of ‘free’ as in ‘free speech,’ not as in ‘free beer’” (p. 3). In this sense free software is not about whether the software can be sold and bought, but rather what is the structure of ownership that guides use of the software. For example, in the current proprietary structure of Photoshop software there is a great difference between a person who has Photoshop and a person who owns Photoshop. The person who has Photoshop can procure it through buying it or stealing it. Without the money, there is no other way to have Photoshop than to enter into an illegal action as my students hacking and borrowing copies of the software showcased in the free and open source alternative node in the data chapter. The person, or corporation, who owns Photoshop is Adobe: no one else owns Photoshop at

least not in any meaningful sense. At first this seems counter-intuitive, but really no one else may own Photoshop in the sense that they may determine what they want to do with it after they pay the money for the license of the software. For example, if you buy a book you then own it based on the ultimate control over the things you may do with it: put it on a shelf, give it to a friend, copy it, or donate it to a library. In terms of Photoshop, you can only “shelve” it if you have the right operating system, you can give it to a friend only if you do not use it, you cannot copy it, and you cannot donate it to a library even if you have paid the hundreds of dollars to have the right to use it. On the other hand, GIMP as free software allows you to do all of these things: shelf it and if you do not have the right version then simply go get the version you need, give it to a friend, copy it, and donate it to a library (although this would be unnecessary because the library can go and get it for free as well).

This is just the beginning of the free software concept, because the ethos of free software does not end with the executable file (the software package itself), but extends to the code that structures the software itself. As Stallman (2010) states, “free software is a matter of the users’ freedom to run, copy, distribute, study, change and improve the software” (p. 3). Free software gives users the right to run and copy the software, but it also gives them the right to access the code, make changes to improve its functionality, and redistribute the software if they desire. All of these abilities are antithetical to the proprietary software structure, and the most poignant example is that of Photoshop itself and the example of the disappearance of the Lighting Effects that was a part of the 32 to 64-bit transition node in the data chapter. As a part of that node one of the issues

was that recoding the Lighting Effects tool within the 64-bit environment was deemed not necessary or too time consuming by Adobe and therefore the reboot within the 32-bit environment option was engineered. As a result the Lighting Effect was effectively dead, because if Adobe programmers were not going to address it then it cannot be brought forward into the 64-bit environment. In the free and open source programming environment if a groundswell of users wanted the effect fully functioning in the 64-bit environment, then it could be a part of the improvements that take place in the community of users and programmers. The ethos of free software, and the more broadly termed free and open source movement, characterizes not only a vastly different market strategy for developers and software industry workers, but in a technological ecology it suggests a very different aligning of resources and ultimately changes the very nature of the collaboration with visual technologies in making digital visual culture. This change has spread the ethos of free and open source from the industry of computer programming and software development, spearheaded by Stallman and his Free Software Foundation, to creative industries that use these various software to question the role of copyright within the realms of creative content and visual technologies (Lessig, 2004).

The scope of this analysis does not allow for a robust discussion of the movements of free culture in digital computing both in the software industry and in creative industries, but a way to easily implement the effects of these shifts in the ethos of collaboration of human-technological hybrids is to return to Donna

Haraway's (1988) concept of "situated knowledge" that was touched upon in the literature review. As a part of her broader feminist critique of scientific objectivity, situated knowledges are a way of conceiving objective knowing as embodied and a part of the complex intermingling of data-bodies within social ontologies, and for Haraway these situated knowledges are articulated through vision. Haraway (1988) states:

I would like to suggest how our insisting metaphorically on the particularity and embodiment of all vision (although not necessary organic embodiment and including technological mediation), and not giving in to the tempting myths of vision as a route to disembodiment and second-birthing allows us to construct a usable, but not innocent, doctrine of objectivity. (p. 582)

The embodiment of vision through situated knowledges allows for understandings in visual nature-cultures "for what we learn how to see" (Haraway, 1988, p. 583) to understand the social construction of vision within the boundaries of data-bodies, which will be discussed more at length in the subsequent section on digital chimera, but also through the resource movements in the technological ecology that supply the visual construction of the social with its material productivity. Therefore, vision as well as visual construction can be articulated through situated knowledge, and forces understandings of collaboration within the human-technological hybrids of the technological ecology to call out the "modest witness" (Haraway, 1997) of visual technologies and creative industries. Haraway's "modest witness" critiques the historical trajectory of scientific practices that barred participation of women and people of color through social inequities and bias, and in a parallel problematic a *modest designer* lurks in the development and institutions of digital computing and

computer graphic histories. A full analysis of the gendered, racial, and classist histories in computer science is outside of the scope of this research, but there are similarities that have already been a part of my investigation. These similarities show parallels in claiming the autonomous Enlightenment subject, leveraging private property of software, the gendered retouching of the frankenstein body, the cloning of misogynist invisibilities of women from history, and the “*agón* of competition” (Darley, 2000, p. 169). Within digital visual culture, this matrix of agencies of the modest designer colonize resources within the technological ecology to constitute its formations.

The question of these formations and the central functionality of the technological ecology metaphor within the social ontologies of visual technologies returns ultimately to the notion of sustainability: what resources amass into formations within the technological ecology are sustained and for whom? The formations of tutorials that constitute the visual construction of the Photoshop assemblage begin to tell the story of sustainability within the technological ecology through the durability of the translations that are continually re-inscribed. Durability, as an ANT concept, points to the coming together of heterogeneous networks of entities, essentially the technological ecology, and focuses on what brings lasting duration to these associations. Within these durable associations are the coming together of both material and human connections, what I have been calling the human-technological hybrid, and these “materials solidify social relations and allow these relations to endure

through space and time” (Murdoch, 1998, p. 360). However, as the literature review indicates in the discussion concerning remediation and digital chimera, materials themselves also showcase a certain durability through space and time in what Latour calls a “congealed labor” of objects (Latour, 1994, p. 40). Latour (1994) states “we hourly encounter hundreds, even thousands, of absent makers who are remote in time and space yet simultaneously active and present” (p. 40). Therefore, visual technologies bare witness to the generations of modest designers that have filled its menus, populated its palettes, and laid out its workspace, and the durability of its formations is fused by the agencies of these modest designers, digital materialities, and computing matter.

The implication of durability can be seen in several examples of the nodes that are presented in the data chapter and further corroborated through the visual construction in Figure 15. Durability in this study is determined by the longevity and scope of a translation in nodes from the data chapter. One example is the durability of the insider/outsider translation that can be seen in the following nodes from the data chapter:

- in the constellation of Photoshop nodes the differentiation of Photoshop offerings is predicated on your status as novice or professional
- in the Down & Dirty Tricks node the publication series (Kelby, 2003; 2009) invokes the insider/outsider translation in both editions despite the lapse of time and changes to the software
- my status as insider when teaching and my students as outsiders was touched upon in the node of free and open source alternative software and in the 32 to 64-bit transition

- the mention of “guru tips” and “working like a pro” by the presenter within the node of Adobe Day invokes strategies for becoming an insider while simultaneously positioning audience participants as outsiders
- and the node of Photoshop semiotics uses a range of teacher and student identities in the pedagogies and practices of teaching and using Photoshop in the art classroom that invoke insider and outsider status

Another example of durability would be the retouching and compositing that are characteristic of photoshopping, as an ethical practice of making visible and/or invisible passages of the visual across a diverse array of cultural spaces. The following nodes from the data chapter erupt in translation with this ethical debate:

- the node cloning invisibility grapples with the practice of erasing women from significant historical documents
- the node Photoshop Disasters highlights the frankenstein treatment of the female body through a myriad of print advertisements
- the node of Adobe Day invoked this ethical debate as the presenter chose to frame his compositing as a result of covering up a crime, although only in jest, and invites the audience to “figure out the ethics” behind this practice of image manipulation
- and the node of histochemical seeing asks practitioners to evaluate their use of Photoshop against strict codes of scientific practice of which objectivity is the hallmark.

Another translation that shows this level of durability is the related translations of market forces and copyright. The translations dealing with market forces and copyright are present in the following nodes from the data chapter:

- within the branding strategies of the constellation of Photoshops node
- within the proprietary nature of the program code exposed in contrast to the free and open source alternative software node
- in the copyright battles of the Photoshop Disaster's blog as they fight Ralph Lauren's DMCA take down notice
- the accounting laws and corporate customer relations that are involved in the 32 to 64-bit transition node
- and the recommendation at Adobe Day to inscribe in the metadata of each image that gets used in Photoshop an author copyright.

All of the examples above, insider/outsider, photoshopping, and market forces and copyright, are important translations because of their durability as translations with the Photoshop actor-network and are important in understanding the allocation of resources within the ecology.

However, the notion of sustainability takes the concept of an ANT durability one step further in asking a moral question of assessing the value of a durable formation. By invoking sustainability within the movement of the technological ecology, consideration for the affordances and hegemonies of the durable formation become a central concern to evaluating its continued allocation of resources within the ecology. So for example, the durability of the translation of retouching that is present in the nodes of the data chapter and a not-insignificant portion of the visual construction of the Photoshop assemblage is reflected upon,

through sustainability, in its value or detriment to social ontologies.

One argument against this moral capacity may be that the presence of retouching within the actor-network of Photoshop is not a result of Photoshop itself, and cannot be tied to the software but only to the specific user. First, within both the explication of digital materiality presented in the literature review and the symmetry of actants within the Photoshop actor-network central to this research, this suggestion would not be considered as taking into consideration the agential contributions of the visual technology within the human-technological hybrid. Second, to focus on the functionality of Photoshop as a reason for its non-culpability within the retouching translation is akin to the commonsense notion that technological tools can be reduced to their instrumentality. This viewpoint has been roundly rejected through a range of critiques from Heidegger's (1977) phenomenological approach to philosophies of technology and through the concept of technological scripts that was used as a framework to understand the many contextual uses of technological artifacts (Akrich, 1992; Latour, 1992). And finally, as ANT sociologists would insist, follow the actant Photoshop into the social ontologies that it enters within the technological ecology as a heterogeneous actor-network that is always already within a formation of the human-technological hybrid. As Bruno Latour (2005) states "it's not technology that is 'socially shaped', but rather techniques that grant extension and durability to social ties" (p. 238). Therefore it is not only a question of how use of Photoshop is socially constructed, but rather to articulate how durable are the

translations that it enters into and to what social ties does it most forcibly lend its practices of collaboration with human counterparts.

To return to the central research question, the technological ecology movement offers the following understandings to the Photoshop actor-network:

1. Within the ecology metaphor, two major formations occur in relation to Photoshop as a part of the technological ecology: tutorials and software. The tutorials, collected with other formations such as retouching or expert, references a large user community that is involved with sharing strategies, judging use, and defining expert and novice practices. The software formation indicates the centrality of Photoshop as a nested ecosystem within the technological ecology that determines branding strategies, publishing material, and the program coding of add-ons.
2. The Photoshop actor-network does not exist without free and open source alternative software in the ecology metaphor. They mutually constitute one another within the ecosystem of image manipulation software, but they are examples of polar opposites between the free software movement and the proprietary software structure. To recognize this articulation of resources within the ecology is to also recognize the modest designers that shape resource allocation.
3. Translation durability gains a moral capacity in the technological ecology through the question of sustainability. Durable translations within the Photoshop actor-network are insider/outsider, photoshopping and ethics, and market forces and copyright.

These three conclusions from the movement of the technological ecology provide

understandings for the types of collaborations and the resource allocation that characterizes the human-technological hybrid.

These three conclusions also return to how the intersections of visuality and ANT in analysis of the social ontology of the Photoshop actor-network offer new understandings to the human-technological hybrid through conceptions of a space-time visuality. As reviewed in the literature review, Mirzoeff's (2006) genealogy of the term visuality calls upon conceptions of visuality to be thought of as a network of space-time associations. For Mirzoeff, the visual subject is constituted through the "intersections between the agent of sight and discourses of visuality" (p. 76), but Mirzoeff calls for rethinking the Lacanian geometric figure of the gaze for more of a spatial relationship that he calls an "area." As Mirzoeff (2006) states:

Visuality is... a time-based medium. This series of connected and dispersed lines, crossing time and space, is a network. (p. 76)

Through the technological ecology focus on resource formation, a spacial emphasis, and durability, a time-based emphasis, there are components of the movement that allow for analysis of a space-time visuality. Analysis of the colonized spaces of the ecology through the dominant proprietary software structures and the sustainability of certain durable translations conceives of visuality as a network. This visuality exhibits disjunctures and continuities in space-time that are significant to understanding the social ontologies of Photoshop actor-network.

Movement of the Digital Chimera: Data-bodies, Digital Materiality, and the Live Image

In order to begin to understand the movement of the digital chimera in the social ontology of visual technologies, it is appropriate to briefly review the important characteristics that were outlined in the literature review. Digital chimera are the data-bodies that populate the technological ecology. These data-bodies emerge through the performance of a digital materiality that is unlike tangible objects, and more the result of a material agency lending its capabilities to the collaboration of human-technological hybrids. As Paul Leonardi (2010) states, when we “describe digital artifacts as having 'material' properties, aspects, or features, we might safely say that what makes them 'material' is that they provide capabilities that afford or constrain action” (n.p.). It is these affordances that shape and craft the materiality of the Photoshop actor-network, and it is through the assemblage of translations that emerged from the data chapter that allows the Photoshop actor-network to declare its affordances in the human-technological collaboration. From the symmetry of actants to the “semiotics of materiality” (Law, 1999, p. 4), so important to an ANT methodology, the assumption throughout this research is to approach Photoshop as a material. However, part of the interpretive movement of the digital chimera, is to understand the digital materiality of the constellation of many Photoshops that were assembled in the Photoshop actor-networks through visibility.

To say that Photoshop is a material object aligns it with a robust history of

scholarship in ANT. After all, the leading ANT theorists are known for their actants: the most classic being Michel Callon (1986) and his St. Brieuc Bay scallops which shook the foundations of social science as the partnership between the fisherman, scallops, and researchers was explored through a sociology of translations. However, to call Photoshop an object has some counter-intuitive threads, but perhaps the very threads of this counter-intuition will serve to bring visuality into the Photoshop actor-network with the proper force of a mediating agent. The distinction I am trying to make here is that the objectness of Photoshop cannot be a thing at all outside of the screen and operating system, and this points to a disconnect between the materiality and the matter of Photoshop. You cannot touch Photoshop, you cannot move Photoshop, and you cannot feel Photoshop. The objectness of Photoshop is entirely dependent on the compiled computer code, which is then executed on the appropriate operating system, and displays a graphical user interface on a screen connected to the hard-drive. When inquiring of the objecthood of Photoshop, it needs to include mouse, keyboard, computer, operating system, screen, and software version to even begin to understand its component parts. This becomes apparent even in the absence of certain parts as the node from the data chapter of 32 to 64-bit transition of computer systems and the Lighting Effects options within Photoshop showcased the interconnectedness of hardware and software in negotiating Photoshop's affordances. However, even taking into consideration the assemblage of hardware components does not include its programming

code, maybe C++ or C#, that is actually the programming language that articulates what the user sees and interacts with on the computer screen. Even if Photoshop is a compiled program made from code that users cannot access due to its proprietary nature, it does not remove its translation from the Photoshop actor-network. The presence of the free and open source software GIMP in both the discourse body explored through the data chapter and in Figure 15 invokes a contrast of very different translations with the Photoshop actor-network due to the relationship of translations in market forces. However, the objectness of Photoshop, as the visual technology in focus for this research, is at essence a visual construction itself. The mouse and keyboard are conduits to manipulating sliders and palettes filled with check boxes and input boxes that fill the node from the data chapter of the constellation of Photoshops with varying GUIs and effects handling. As this node also indicates, the proliferation of touchscreen and body-kinetic interfaces is changing the prosthesis of grabbing, switching, and entering inputs, but the fact remains that you always manipulate a ghost, an image of an object that has no tactile surface. Examples of this proliferate in the screenshots present in Figure 15 that showcase a wide range of material performance whether from the Adobe corporation highlighting innovation within the GUI or from individual users sharing a certain effect through a tutorial they have shared online.

In order to understand Photoshop's objectness that is glimpsed through these nodes from the data chapter, it is necessary to think in terms of its digital chimera as the outcomes of the collaborations between actants in both its material and visual performance. In following an ANT symmetry of actants,

searching for the material performance of the actant Photoshop comes up lacking when materiality is defined singularly through matter: the digital materiality of Photoshop is itself the effects of collaboration within the human-technological hybrid. As a result, Photoshop's material agency becomes visible through the social ontology assembled through the image search (Figure 15) as a visual construction: the retouched human bodies, the special effects text graphics, the color-adjusted photographs, and the fantasy creatures that are all present in Figure 15 are the digital materiality of the human-technological collaboration.

However, defining the digital materiality of the Photoshop actor-network as the output images that result from image manipulation does not go far enough in understanding the movement of the digital chimera in relation to visibility. As Peter-Paul Verbeek (2006) states “like a theater play or a movie...technologies possess a 'script' in the sense that they can prescribe the actions of the actors involved. Technologies are able to evoke certain kinds of behavior” (p. 362). In this way the script is flexible, but “scripts transcend functionality: they form a surplus to it, which occurs once the technology is functioning. When technologies fulfill their functions, they also help to shape the actions of their users” (Verbeek, 2006, p. 362). This same immanent surplus can also draw parallel comparisons to what computer games scholar Barry Atkins (2006) calls the “present of the future” involved in the game gaze. His analysis of the game gaze focuses on “the image seen within play is always one that invites intervention and choice and

produces a fleeting stream of swiftly changing images” (p. 135). Although his discussion is focused on the relationships between graphics and game play in video games, his theorization of a game gaze connects the future-tense speculation of users that invite a “possible future of a vast array of potential images [that] is accessible only to the player and not to the spectator” (p. 135, brackets are my inclusion). And so to understand the Photoshop actor-network in the movement of the digital chimera is to understand its affordances, or how Photoshop in its material performances “help to shape” interactions through a gaze of future-tense speculation. The affordances of the Photoshop actor-network that emerged from the nodes in the data chapter are:

- Retouching and compositing: What could also be called “photoshopping,” these are the central techniques of Photoshop's usefulness as a graphic design software and the central intervention within the manipulating images. Retouching and compositing were showcased as an affordance of the software in the following nodes from the data chapter: constellations of Photoshops, Down & Dirty Tricks, Photoshop disasters, cloning invisibility, histochemical seeing, Adobe Day, and Photoshop semiotics. In each of these nodes Photoshop evoked into translation with human counterparts through capacities of retouching and compositing images. The visual construction presented in Figure 15 further corroborates these affordances as the main clusters of images are connected to retouching and compositing through tutorials, retouching, failure, and expert examples.
- Market forces: The introduction of market forces and copyright are an

important affordance of Photoshop through creating expert content as in the Down & Dirty Tricks node or through the contested rights of copyright holders as in the Photoshop disasters node both found in the data chapter. Market forces are also present in the node of the Adobe Day when the presenter indicated a way to assign copyright in the metadata of all images used in Photoshop. Not only do the affordances of market forces relate to future-tense speculation of image production, but also to the program itself. Its proprietary software status is seen clearly in opposition to the free and open source alternatives in the free and open source alternative software node. These market forces are also seen in Photoshop's status as a branding strategy that is larger than the actual software product seen in the constellation of Photoshop's node from the data chapter. And finally as a product involved with a customer base, economic governing bodies and accounting law, and hardware trends in the computer industry in the 32 to 64-Bit transition node. All of these nodes from the data chapter, both in image manipulation and through the software itself, invoke the Photoshop actor-network's affordance for market forces.

Outlining these affordances does not close down Photoshop's potential, but rather re-assembles the translations of a material performativity that is a direct result of my constituting the Photoshop actor-network in the nodes from the data chapter. The affordances as material performativity of the Photoshop actor-

network can be seen through the visibilities and invisibilities of image manipulation practices, and when perceived within social ontologies may provide an affordance for a kind of visuality that thrives on the immanent surplus: a future-tense speculation that asks “what happens next if I’ that places the player [designer] at the center of experience” (Atkins, 2006,p. 127, brackets are my inclusion). In other words, the affordances of Photoshop not only characterize the outputs of visual production, but also engender certain visualities as a visual construction of the social world. If the technological ecology movement brings understandings of the space-time disjunctures and continuities of visuality as a network, then the digital chimera movement focuses on perceptions of the present and future visualities of the digital age.

However, to suggest that Photoshop alone engenders certain visualities ignores the contributions within the human-technological hybrid, where both data and the body must co-emerge as symmetrical actants. In this sense, the body and its affordances to image manipulation practices within the social ontology that is the Photoshop actor-network becomes very important. One way to account for the body is through what Andrew Darley (2000) calls the “*intensities* of direct sensual stimulation” (p. 168, italics are the authors). These intensities account for the affective affordances of the spectator of digital visual culture, in their co-constitution of digital material performativity, and important in understanding any sense of the visuality that is engendered within the social ontology of the Photoshop actor-network. The bodily sensation eclipses notions of interpretation, narrative, and hermeneutic forms of meaning-making, although within our model of emergence these can also be considered component parts, and it is the

sensation of the material performativity that drives these intensities. Darley (2000) describes the digital visual culture spectator as

more of a sensualist than a 'reader' or interpreter. The spectator of visual digital culture is positioned first and foremost as a seeker after unbridled visual delight and corporeal excitation. The centre of sensual assault s/he is someone who—depending on the genre—is in pursuit of the ornamental and the decorative, modes of embellishment, the amazing and the breathtaking, the nuances of the staged effect and the virtuoso of the moment, the thrill of vertigo or the *agôn* of competition. (p. 169)

This mediascape of digital visual culture, populated with the digital chimera of human-technological material performativity, is instructive for Darley's investigation of the spectator within digital visual culture, but requires further elaboration in this study due to the productive nature of image manipulation and the centrality of material performativity as a form of active play or what I called above a future-tense speculation in the image manipulation process. Without questioning the productivity involved in being a spectator, my point is more to pay attention to the interactivity of making as forms of play that visual technologies such as Photoshop require of users and may be elaborated upon through the levels and capacities of this interactivity. One way to get a deeper understanding of this interactivity is through the role of ergodic involvement that is a multifaceted form of engagement that can be best characterized as “nontrivial effort” (Aarseth, 1997, p. 1). The notion of ergodic involvement has been explored through a wide range of contexts, but again, as with the comparison to Atkins' (2006) game gaze, the investigations within video game research are the most appropriate comparison for the visual technology

Photoshop.

As a visual technology, Photoshop shares many attributes with video games: navigation of a range of choices for certain outcomes, puzzle-like configurations of manipulating and navigating through a range of complex outputs and inputs, and a certain level of tiered accomplishment that establishes an insider/outsider community of users. Game theorist Gordon Calleja (2007) goes to great length to develop a “detailed map of the phenomenon of game involvement” that includes up to six frames of ergodic involvement, and these similar frames of ergodic involvement can be seen in the nodes of the Photoshop actor-network from the data chapter. The following is an outline of the six different frames of ergodic involvement outlined by Calleja coupled with its presence within the data:

1. Tactical involvement deals specifically with strategic planning or approach to the game environment, which is very similar to say having a strategy in mind for creating a certain effect in Photoshop through a certain combination of tools. Tactical involvement can be seen in the Down & Dirty Tricks node that shows an entire publishing industry of how-to manuals that publish strategies for using Photoshop to achieve certain effects. This strategy sharing is also evident in Figure 15 as a large section of the images deal directly with the availability of online tutorials.
2. Performativity involvement refers to the actual using of the game, and in Photoshop this relates to the control of tools and interfaces. Although, Photoshop does not have the time constraints or perceived risk that accompanies game play, the use of different interfaces, pressure sensitive

drawing tablets for instance, does present certain levels of virtuosity with performing in the node of the constellation of Photoshops. Another interesting difference here is the introduction of failure: in game play failure can be rather clear in not leveling or accomplishing the goals of the environment, but in Photoshop failure is more a process of negotiating effect outputs in comparison to user intent. The nodes of Photoshop disasters definitely uses judgment of failure as parameters for including images in the blog, but these failures are not as clearly standardized as leveling in a gaming environment. Like many creative processes, this cannot discount the serendipity of accidents and new directions of image manipulation which may be a result of unintended results. Additionally, another component to the performativity involvement that is unique to Photoshop is the automated effects where photoshopping is almost taken over by the software itself. This type of automatic image manipulation is both in the constellation of Photoshops node where Adobe is showcasing enhanced features that make image editing rather effortless and in the Adobe Day node where the presenter states, when using certain features, that Photoshop “recognizes what I’m trying to do” (quote taken from my field journal from May 17, 2011).

3. Affective involvement relates to the player’s “emotional arousal” which can manifest from aesthetic experiences in the game space to excitement in game-play sequences (Calleja, 2007, p. 244). In Photoshop this emotional

arousal can be related to the perceived success of the manipulation in process, and can have significant impact on how a user navigates perceived failures and continued development within the environment similar to game play and the persistence of getting better at the game. The emotional content attached to improvement easily equates to the insider/outsider translation which was associated with several nodes: constellation of Photoshops, free and open source software alternatives, Down & Dirty Tricks, Adobe Day, and 32 to 64-bit transition. The affective involvement is also present in much of the Figure 15 visualization as many of the images are used to attract the user's affective involvement: the expert images are meant to impress, the tutorials are meant to intrigue, and the retouching images are meant to entice.

4. Shared involvement refers to aspects in multi-player games where several users collaborate to obtain goals or move through game space together. Although Photoshop does not have a full collaboration mode, there are important aspects of Photoshop use that involve communities of users. Within the work space of Photoshop the introduction of CS Live has brought several tools within the Photoshop GUI that allow users to share their work for feedback and design planning within collaborative environments. Outside of the Photoshop GUI, there are extensive resources in online communities of users that offer tutorials and design communities where users share tips and techniques for accomplishing certain effects using Photoshop which can be seen in the nodes that include the crowdsourcing translation such as the Photoshop disasters

node. This is also evidenced quite strongly in the network visualization from Figure 15 where a significant portion of the images can be characterized as related to online tutorial content. In addition to the communities of human collaborators, the constellation of Photoshops node presents an array of different technological actants for collaboration. This interpretation of the shared involvement including the technological actant as collaborating entities that draw upon the shared involvement of their human counterpart is not a part of Calleja's discussion of games, but my own emphasis on actant symmetry certainly makes it an important distinction within this study.

5. Narrative involvement also suggests a slight shift in relationship to Photoshop versus the video game environment. Calleja refers to the importance of narrative structure in relation to game play of video games as an enduring debate within gaming scholarship, and he frames the narrative involvement within its relationship to drawing players into the gaming environment. For Photoshop, there is no outright narrative, but narratives are constructed around user virtuosity as the insider/outsider translation, so significant to the Photoshop actor-network, certainly expresses narrative structures for viewers to understand their own involvement with using Photoshop. There is also the aspect of narrative from the creation standpoint not just the participation view. James Paul Gee (2008) talks about this aspect in game play where users can actually

create game spaces within the game as significant in understanding the cognitive simulation opportunities that game play affords users, and I would assert the opportunities to create narratives through image manipulation in Photoshop working environments affords similar possibilities although resulting in decidedly different digital chimera. In addition, the narrative of retouching has significant narrative potential and has been evoked in many nodes including Photoshop disasters and cloning invisibility nodes.

6. Spatial involvement refers to the ability of players in game spaces to locate “oneself within a wider game area than is visible on the screen” (Calleja, 2007, p. 252) through mental maps, references from other players, in-game maps, or out-of-game maps. This aspect concerns a sort of game geography that is not well related to the Photoshop working environment, but a spatial aspect is present in image manipulation software particularly in perceiving the two dimensional image plane through the layers palette which is a central feature of many of the Photoshop offerings in the constellation node and a highlighted feature during the Adobe Day demonstrations. A significant understanding to navigating and working in Photoshop requires an awareness of building the image through the layers palette a sort of stack of image strata that build the image. Users must understand what layer they are in in order to commence with image manipulation otherwise the editing process can be quite frustrating and limited. Understanding the layers palette and communicating this spatial understanding of how images are created in Photoshop is an important

early lesson for students in my Art Education 252 classes.

All of these ergodic involvements (tactical, performative, affective, shared, narrative, and spatial) should not be seen as operating separately, as Calleja asserts for game play as well, but rather the complex and dynamic ways that image manipulation call upon the affordances of users in making digital chimera.

The affordances of ergodic involvement begin to frame the digital material performativity of the human within the human-technological hybrid of the Photoshop actor-network, so that the contribution of both data and the body can be understood. Any sense of the visuality that the social ontology of Photoshop engenders must take into account this symmetrical formation, and deny the autonomy of either in the creation of digital chimera. Similar to the use of the cyborg metaphor discussed in the literature review, understanding the data-bodies of digital chimeras allows for comprehending visual constructions within dynamic potentiality that draws equally from both the technology and the user as a future-tense speculation of playing in image manipulation. From this perspective, critique and analysis of sustaining certain visibilities that emerge can be carried on within a scope of possibility that does not over determine the production of digital chimera, but also does not ignore the affordances of the human-technological hybrid that created them.

One last concern with the movement of the digital chimera is the role of remediation in understanding Photoshop as a visual technology. As the literature review outlines, remediation connects practices of digital image manipulation

with photographic practice within a historical trajectory of image making, and imbues digital chimera with a certain inheritances. In mapping the historical trajectory of technologies, these inheritances through remediation were embodied in the digital chimera through the concept of the skeumorph: “a design feature that is no longer functional in itself but that refers back to a feature that was functional at an earlier time” (Hayles, 1999, p. 17). If the Photoshopped image is the digital chimera of the Photoshop actor-network's digital materiality, then the image itself is a skeumorph of representation. Considering the historical progression of the image in the age of mechanical reproduction (Benjamin, 1968) and its remediated presence in the digital form, the progression of the image as representation through the analog to digital transition shows a certain element of lag in the signifying functionality of the image. Representation, as the signifying functionality of the image, becomes a skeumorph within the digital materiality of the photoshopped image as signification itself can be seen as “a design feature that is no longer functional in itself but that refers back to a feature that was functional at an earlier time” (Hayles, 1999, p. 17).

A good example of this signifying functionality of the image as a skeumorph within representation and photoshopped images is the working process of keeping an image “live” in the Photoshop image manipulation process (the presenter from the Adobe Day node in the data chapter used the term “live” to express this capability in Photoshop). Oftentimes, I express to my students the value of the “live” image in Photoshop as a way to keep your original source material infinitely editable. For example, you can open an image from your digital camera in Photoshop and proceed to do a number of edits to the image: lighten

the contrast, change the color balance, make your hair purple, etc. The non-live image editing work flow will commit these changes directly to the image layer that will require the image to be saved and the changes will become a permanent part of the saved image file unless a copy is made and saved under a different file name. This work flow will change the image permanently. In a live work flow, the original image is imported into the Photoshop working environment and is contained in a layer. Again, layers are a fundamental concept of the Photoshop working environment and allow for a number of capabilities that have made Photoshop such a useful image manipulation software, and in the live work flow the image edits that were committed in the first example, i.e. lightening the contrast or changing the color balance, are now contained separately on their own layer through a technique that utilizes layer adjustments. These layer adjustments allow the user to contain the image manipulation within its own layer, not applying it directly to the image layer, which allows the user to continue to manipulate the adjustment as many times as desired. If the image color balance is pushed to be more red and then after many other steps the user decides to push the color balance more blue they can use the color balance layer adjustment to make these changes without permanently effecting the original source material, the image itself. Likewise, if the contrast is heightened at the beginning of a manipulation and later in the process the user decides to remove the contrast adjustment the layer adjustment that contains the contrast change can be deleted thereby removing the contrast change without changing

the original source material. In this way the adjustments are infinitely editable, because the live work flow has localized the adjustments to discrete layers that can be removed or changed at any time in the working process as many times as desired. Unlike dodging in the photochemical process that results in the lightening of areas in a printed analog photo or the contrast shifts committed directly to the image layer in non-live work flow approach, the signification function of the image itself is dissected: strong contrast drawing attention to certain passages of the image are now a function of the adjustment layer that works in tandem with the image not contained in the image itself. And this is only the most basic of examples, because the range of photoshopping that can be done is almost infinite: removing elements, compositing impossible juxtapositions taken from many different photos, and introducing light sources that did not exist in the context of the original image are only a few of the possibilities. And layer adjustments are not the only technique within the Photoshop working environment that enable a live work flow: smart objects and layer masks are two other tools that allow live work flow techniques that compartmentalize image effects and manipulations from the original source material in the Photoshop layers palette.

The effects of the live work flow as an ontology of photoshopping removes the image from the signifying function of what representations do in visual culture. When the spectators of digital visual culture remark “I know it has been photoshopped because I can see the pixels,” as the presenter from the Adobe Day node from the data chapter stated as a part of his presentation, they invoke a seriation of image signification that is passing from the digital into the

photoshopped visual. The retouched image of the photoshopped visual, never a new phenomenon as remediation of photochemical processes showcase the manipulations of the photochemical image from the darkrooms of an analogue past, is a more profoundly retouched surface, a layered surface of manipulations that hover in signifying strata before and behind the image, coding and recoding within the dynamic collaborations of digital materiality. True to the nature of a skeumorph, the image is not gone from this signifying process but rather a signpost from prior visual culture regimes of representation.

The image had previously been transformed from the photochemical process to the digital pixel, and it appears that another transformation is taking place within the dissected signification of the live image in photoshopping. The visibility of the live image can be seen in different effects throughout the Figure 15 visualization. The visualization showcases the live image as infinitely controllable to exact visual intensities as the mass of tutorial images give numerous strategies. The retouching image mass pinpoints these intensities through the display of before and after images where retouching effects have been applied. The visibility of the live image signifies both the before and after simultaneously as the infinitely editable image that exists in a future-tense. The mass of fail images are collected on the assignment of failure, not of creating visual intensities, but rather for displaying the live image in modes of closure: a death in editing and a lack in achieving the intensity of the image that is possible through the live image. This virtuosity of the live image is displayed in the mass

of expert images, visual resumes of advanced designers and image manipulators showcasing their ability to collaborate with the actant Photoshop. The visuality of the live image is a visual construction of the social that dazzles in visual intensity through a permanent invisibility always in anticipation of the infinitely editable surfaces of the image.

Perhaps the most telling example of the live image visuality is the discussion of scientific visualization that is found in the histochemical seeing node of the data chapter. As a part of this node, the role of photoshopping is discussed in relation to the field of histochemistry (Rossman & Yamamda, 2004). In this one example there is a powerful translation of understanding objectivity, scientific visual culture, representation and its relationship to truth, and the role of the viewer within the new visualities of the live image. As Rossman & Yamamda (2004) state, spectators within visualities of live image have certain advantages, because they “can now spot these manipulations” (p.13). Therefore, evaluating the image for its significance to scientific conclusion is nested inside of a broader viewing process that takes into account the live image of photoshopping. Although the authors are making a plea to reassert the truth of images in scientific visualization, there argument simultaneously makes images suspicious and representations of the truth at the same time. This role of the suspicious viewer, the both/and determination of the truth and falsity of images, and the acknowledged role of visual technologies as playing a central role in this shift are all characteristics of the visual construction of the social that is the live image.

Movement of Network Being: Scale-free Networks and Translation Hubs

Live image visuality, engendered by the proliferation of digital chimera within a technological ecology, is presented as a visual construction of the social that exists in a technologically networked social ontology. The interpretive approach of the network being movement is to recognize the connections of networked computing to non-technological networks of collaboration, which is well represented in the variety of technological and non-technological actants that constitute the Photoshop actor-network in the data chapter, and to further understand the implications of network structures to social ontologies. In the literature review, I also connect the network being to what Latour (2005) calls a “matter of concern.” To see matters of concern is to see objectivity multiplied, which its foundation as an ANT methodology of assembling mediating actants that are without unity that is again one of the characteristics of the Photoshop actor-network presented in the data chapter.

It is paramount to this study that the visual is re-articulated as a matter of concern within the social ontology, and that the gathering of visuality and visual technologies provide new assemblages through which visual nature-cultures may be perceived. One way to assess the gathering of visuality and visual technologies is through the assembly of translations that characterize the data chapter. The chapter performs an important job in this writing as a risky account of my following the actant Photoshop, but it also focuses explicitly on gathering the translations of the Photoshop actor-network. In this way, the data chapter

displays the network formation of the actant in the flattened spaces of a social ontology that does not prioritize and order these translations. However, as the literature review indicates for the network being movement, not introducing an order to the translations does not foreclose power dynamics that operate within the ontology. I have already eluded to understanding the power dynamics within social ontologies through the technological ecology and the notion of durability: the idea being that more durable translations colonize resources within the ecology and therefore are perceived as being more powerful entities within the ecology.

As was discussed in the literature review, in the network being movement there is the interpretive strategy of network analysis that looks to the structure of the network to understand some of its power dynamics in addition to understandings that the ecology metaphor allows. In particular, the work of physicist Albert-László Barabási (2003) has demonstrated that an understanding of networks as decentered is only partially accurate, and that a clearer articulation may be in the form of the scale-free network. Scale-free networks are characterized by heavily connected hubs within the network as opposed to an even distribution of connections from node to node within the network formation. The basic rule for scale-free network structures is that the nodes that have more connections tend to generate more connections. This greater level of connectivity exhibited by certain nodes indicates a level of power and hence begins to articulate the power dynamics that the network structure exhibits.

Analysis using the network being movement then needs to address two things: 1) whether the Photoshop actor-network exhibits the characteristics of a

scale-free network and 2) to determine what power dynamics this structure indicates for understanding Photoshop within its assemblage. The following addresses these two issues through the nodes that are presented in the data chapter and through the visualization that started this chapter (Figure 15).

First, to evaluate the Photoshop actor-network's structural characteristics is an exercise that focuses on what constitutes a connection within the network. In order for nodes to arrange in a network structure of any kind, the connections are the most vital component, and in the ANT methodology that was used to gather the data of the previous chapter it was the translations that constitute the connections that are the focus. As Law (1992) states, translation is “the process...which generates ordering effects such as devices, agents, institutions, or organizations” (p. 366). Therefore, when actants are involved in translation they are mobilized in the network to perform knowledge in certain ways that is fostered by the relationships that have been forged through their interactions with other actants. If there is a scale-free dimension to these knowledge performances as a result of actant interaction, then it would follow that despite the actants involved there would be a repetition to the translations that are encountered within the actor-network. This is no small point: to assign a scale-free structure to the actor-network there needs to be a consistent return to certain translations regardless of the particular actants involved. And indeed, the translations found in the Photoshop actor-network from the various nodes of the data chapter do display a certain organization around five translation themes:

innovation, insider/outsider, crowdsourcing, market forces & copyright, and photoshopping & ethics (see Figure 14). In the data chapter the Figure 14 visualization was used to collect the translations into clouds of associations around these five translation themes, but within the movement of the network being these associative clouds can be seen as the powerful hubs through which connection, or translation, to the Photoshop actor-network is determined. Therefore, these five translation hubs are important to the types of knowledge performances that are a part of the Photoshop actor-network, and if they are in a scale-free formation then the diversity of actant interaction should demonstrate convergence around these certain types of knowledge performance.

One way to further corroborate these five translation themes as powerful translation hubs within the scale-free network is to utilize the visual construction of Photoshop's social ontology presented in Figure 15. At the center of Figure 15 there is the central actants of the study, myself and Photoshop, that combine to form the Photoshop actor-network, surrounded by the five translation themes, and then surrounded by groups of images that were collected in the data chapter from a Google image search. As was explained at the beginning of this chapter, the images were grouped together within certain translation categories: Photoshop constellation, Tutorials, Retouching, Fail, GIMP, and Expert (see Figure 16). These image translation categories are examples of the types of knowledge performances that the power dynamics of the scale-free network structure dictates. All of the images from the search return to the Photoshop actor-network through the five translation hubs and often times through combinations of more than one of them. A screenshot of a new feature in CS5

Extended that is in the Photoshop constellation invokes the translations of innovation and insider/outsider. An image that points out the obvious photoshopping in an advertisement and is labeled a failure enters the actor-network through the crowdsourcing and photoshopping & ethics hub. Images showing a collection of free brush add-ons ready for download enters the network through the crowdsourcing, innovation, and market forces & copyright hubs. The examples from the Google image search go on and on, but the repetition of certain powerful translations both in the data chapter and in Figure 15 leads to the conclusion that the Photoshop actor-network exhibits a scale-free network structure if the translations are counted as points of connection.

If the scale-free structure can be confirmed as I have reasoned above, then the second task of the network being movement in analysis of the data is to try to discern what dynamics of power this might ascribe to the Photoshop actor-network. The following is a case by case evaluation of the translation hubs that arise from a variety of actant interactions, and they are presented in the following as knowledge performances that are associated with those translation hubs:

- Insider/outsider: The data chapter presents several nodes that have the insider/outsider translation that comes from the interactions of different kinds of actants. In the constellation of Photoshops node the Adobe corporation as actant is involved in translation with the branding of Photoshop software options that indicate different levels of novice to expert use of the software. In the Down & Dirty Tricks node, the expert

authors as actants create a publishing industry that portends to provide strategies for attaining insider status to outsider users. In the Adobe Day node, the presenter as actant positions the audience as outsiders to his insider “guru” knowledge. These first examples position expert knowledge within restricted access available through product consumption whether it be a how-to manual, a more advanced version of the software, or access to expert demonstrations. However, there is also a fair amount of the insider/outsider translation that happens within classroom contexts. My own role as a teacher framed as insider and students as outsider is present in the 32 to 64-bit transition node, and there is a range of insider/outsider metaphors that are used throughout the Photoshop semiotics node in reviewing teacher-students learning using Photoshop. As a knowledge performance, the insider/outsider translation is not the most conducive to achieving learning, and in the articles reviewed in the Photoshop semiotics node almost completely ignored by the authors. Instead, Photoshop is something a teacher can “simply add” to preexisting art lessons (Wilson, 2003, p. 224), it is “user-friendly and easy for students to grasp” (Murphy, 2003, p. 42), and instruction is supported through the “step-by-step instructions” (Murphy, 2003, p. 42; also see Mathes 2007 & 2009) that are a hallmark of the how-to manuals referenced in the Down & Dirty Tricks node. There is even an author who consciously resists the “role of the expert” (Gill, 2009, p. 112). However, following the actant Photoshop, recognizing its complexity as an actor-network that is in translation does not allow for any easy dismissal of the insider/outsider

translation as a powerful hub within the Photoshop scale-free network formation. Recognizing the power of this translation allows teaching practice to perform different knowledge than the guru, but only if other powerful hubs exist as alternatives.

- Crowdsourcing: As it turns out there are such alternatives: crowdsourcing provides a counter balance to the insider/outsider bifurcation in its most beneficent form. No doubt that the opportunity to view the insider/outsider translation may in fact be in the same nodes where the crowdsourcing translations are present, but it provides a stronger collaborative inclination that may balance out the exclusivity of the insider ethos. There are two nodes that have different actants in translation with crowdsourcing, but the outcomes are very different: Photoshop disasters and spyware as software. In the former node the actant in translation with Photoshop is the community of users searching out graphic design failures, but the blog environment itself tends to position the community in a framework of empowerment, as if to recognize their literacy of photoshopping within a live image visuality. To catch a failure suggests a certain virtuosity in recognizing the invisibilities that make live images infinitely editable and indicate a certain savvy as a player/spectator in a digital visual culture. On the other hand, the spyware as collaboration node showcases a very different actant, the Adobe corporation, in a very different kind of crowdsourcing that does not distribute power. In this node, I question the

type of collaboration or sharing of knowledge that is taking place within the spyware model that Adobe deploys, with permission, onto the hard drives of its Photoshop users. These two examples give a good sense of the spectrum of crowdsourcing and its knowledge performance, collaboration versus farming perhaps, but other translations of crowdsourcing seem to call to a collaborative element that distributes power in the knowledge performances within the Photoshop actor-network. In the cloning invisibility node there is the collective investigative of the online community in the process of uncovering the erasure of certain female political figures from the White House photograph. In Figure 15 there is a dominant mass of tutorials freely available to users online to learn techniques and improve on strategies of collaborating with the actant Photoshop. These sharing environments are important as powerful hubs of knowledge performance in the network structure of Photoshop as they indicate a balance to the insider/outsider translation and may be the route for connecting to a knowledge performance that truly does engender a “collaborative process” (Hutzel, 2007, p. 37) within the Photoshop actor-network.

- Innovation: At the heart of the innovation translation hub there is the evolution of the collaborative process that is the human-technological hybrid, and returns to the very need of this research: the ubiquity of digital chimera within an expanding technological ecology. Innovation, as a powerful translation, in the Photoshop actor-network returns again and again to a proliferation of technologies in their applications to human life. Two nodes that showcase the translation of innovation with very different

actants are the constellation of Photoshop's node and the Photoshop semiotics node. In the former we see the actant Adobe corporation showing the new features of different Photoshop releases such as "enhanced Spot Healing Brush" or the Photomerge option so that "you can create the perfect photo your camera couldn't capture" (Adobe, 2011d). We see this same level of human-technological collaboration in the Adobe Day node when the presenter refers to the content-aware option as a way of "letting Photoshop" do it for you (quote taken from my field journal, May 17, 2011). Actant collaborations as innovation offer a very different variation on this translation in the Photoshop semiotics node when considering technology integration. In many of the articles discussing use of Photoshop in the art classroom the larger curricular movement to integrate technology across the curriculum into all subjects was a part of the discussion. The notion of technology integration brings to the translation of innovation just what type of knowledge performances are manifested in the increased and ever ubiquitous human-technological hybrid. The question is not what is the technology doing for the students, but rather how is the technology collaborating in what is being taught?

- Market forces & copyright: The translation hub of innovation ties into the market forces & copyright hub, because as a consequence of innovation manifest through the increased collaboration of the human-technological hybrid, some of what is learned through the knowledge performance in

this hub is inscribed with these market forces. In this sense the power dynamics of the market forces translations of the Photoshop actor-network reinforce a proprietary visual culture. We see this translation's power dynamics in many nodes of the data chapter with an equally diverse gathering of interacting actants. The actant Adobe corporation utilized the market forces translation through the branding strategies of the proprietary software offerings that are displayed in the constellation of Photoshop's node. The actant modest designers of Adobe defer from updating certain effects in this same proprietary code to a desiring customer base in the 32 to 64-bit transition node. The actant presenter on Adobe Day teaches the novice audience members to deploy these same translations of a proprietary power over their images through the author copyright metadata, because as the presenter stated "I copyright all of my photos, why not?" (quote from my field journal, May 17, 2011). The proprietary dynamics of the market forces translations of the Photoshop actor-network infiltrate visual culture by invoking copyright, but there are different examples of how this becomes a knowledge performance in the nodes. On the one hand, in the cloning invisibility node, the blogosphere appears concerned about the erasure of women as a misogynist invisibility, but it is the infringement of copyright that may ultimately condemn the photoshopping of the White House photograph giving the legal issue of copyright and the ownership of images priority over the problematic of gender inequality. On the other hand, the blogosphere also exhibits firm resistance to the power dynamics of the market forces & copyright

translations. In the Photoshop disasters node, the administrators of the website *PSD: Photoshop Disasters* take a firm stance against the copyright bullying of the Ralph Lauren corporation. This same resistance is a part of the free and open source alternative software node as this alternative free software movement presents a complete dismantling of the proprietary structure. Even in my students hacking and borrowing (stealing) of the software Photoshop, there is a subversion of the proprietary power dynamic that is a part of the market forces & copyright translation hub. This hub in particular showcases contested power in the knowledge performances that erupt in translation with the market-forces & copyright translation, because as the nature of translation as a process or negotiation indicates even the negation of market forces, such as the free software movement, still connects through the translation hub.

- Photoshopping & ethics: This final translation hub makes connections to the market forces & copyright on the morality of making software free, but the ethics of what to do with it when you do harness its capabilities. As was stated earlier in the chapter, the idea of a digital materiality gives a material outcome to the human-technological hybrid that results from certain affordances that both actants in the hybrid bring to the collaboration. From this perspective, the photoshopping & ethics translation hub drives at the very heart of the symmetry involved in these collaborations, as it asks the question of what power dynamics will be

granted to the technology as it is deployed in the human-technological hybrid. In other words, how will the availability of its affordances be reflective of an ethical social code? This question is asked over and over in the nodes. In the Photoshop disasters node the actant community that collects through the website *PSD: Photoshop Disasters* are performing an ethical code by calling out the failures in photoshopping: the frankenstein body, the copyright bully, and the closure of the live image. In the free and open software node, I, as actant, question my own ethical standing in using proprietary software in my class in ways that contribute to my students' illegal activity and reinforce an insider/outsider translation due to my own familiarity with Photoshop, that has been questioned for its contributions to the learning process. In the Adobe Day node, when the presenter relinquishes any ethical responsibility in his photoshopping practice by focusing his demonstration on what Photoshop can do for the user and not the ethical implications of what that collaboration may entail: as he states "I'll let you figure out the ethics" (quote from my field journal, May 17, 2011). The power dynamics in the photoshopping & ethics translation are focused on the power dynamics of the symmetry in the human-technological hybrid in the Photoshop actor-network. This translation hub invokes a relational give and take to the affordances of users and software that questions the power of an ethical code in the midst of our ergodic involvement with technological actants.

What these cases indicate to the network being movement is that there are a range of actants, diverse in nature, which enter into translations with other

actants, but that certain translations become dominant within the network formation. In the movement of the network being, this dominance indicates a certain preeminence in knowledge performance that relates to the translations, the interconnectedness of actants, in their social ontologies. Another way to look at this preeminence was through the idea of actants as mediators within the gathering that was used to judge whether a node should be included in the data chapter. However, the difference here is that the mediating actants exhibited a scale-free network of translation, which allows for the variety of actants to come together in certain powerful hubs. As such the movement of the network being provides a way of perceiving the technological and non-technological networks of a social ontology through the interconnectedness of translation, and to better understand the relationships of power within the scale-free connectivity of the actor-network.

Conclusions: Performing with Photoshop

These three movements allow for a further harnessing of the data in ways that allow for deeper understandings of the Photoshop actor-network. The data chapter re-presented the ANT methodology of following the actant, and offers an unusual portrait of Photoshop through many actants, in many spaces, and with a variety of translations. However, this chapter has focused on using the technological ecology, digital chimera, and network being movements to analyze that data to better understand the social ontology of the Photoshop actor-

network. This social ontology was perceived both through the data and through a visual construction that was an explicit attempt to bring the force of visuality theories to the analysis of the data in ways that were not present in the data chapter. From this perspective, I see the data chapter as not only a curation of the data corpus to re-present the most prominent mediating actants within the Photoshop actor-network, but a performance within this research of an ANT methodology in and of itself. This chapter has been a more concentrated effort to bring the intersections of theories of visuality and ANT, as was the charge of my central research question, to the analysis of the social ontology of Photoshop not only through the theories but also through the visual. In this way, I consider Figure 15 to be a culmination of the research, and one example of what intersections of visuality and ANT may look like in examining Photoshop as a human-technological hybrid.

This also brings me to my first subquestion: what does visuality in a social ontology offer to understandings of human-technological hybrids? The central answer to this question would be related to recognition of the symmetry that defines the materiality of human-technological hybrids. If visuality is both a focus on the social construction of images and the visual construction of the social, as has been forefronted throughout this study, then the operation of visuality needs to focus on the performance of symmetries within the human-technological hybrid as it is deployed through its collaborations. As the live image visuality that was discussed in the digital chimera movement indicates, the progression of digital visual culture is one that must take stock of its powerful and ubiquitous technological actants. They harbor modest designers in the code, market forces

in creation, and call upon a delicate balance of ergodic involvement. The materialities that users and visual technologies make together provide a terrain of knowledge performances that are not decentered or infinite, but rather focused through the scale-free network structures that connect through powerful hubs of translation.

Of course what also is of interest is the chiasmic expression of this sub question: what do human-technological hybrids offer to understandings of visuality? In this regard, I would point to the methodology of this research as a prime example of their offerings. From search engine actants to the visual technologies that created the visualizations throughout this research, the human-technological hybrids that forged partnerships in many of the methods of this research present opportunities to understand the visual construction of the social in ways that are more powerful than ever before. The connections of visual culture scholarship and technology were outlined in the literature review, but here I am making the suggestion that the expansion of the technological ecology is also an expansion of visual culture in that we are daily inundated by the live image of network culture. Not only is volume increased, but the potential for ever more powerful human-technological hybrids to increase our ability to visualize this phenomenon are greater. To involve the power of these actants within the understanding of visual culture is almost as fantastic as the cyborg metaphor so central to posthumanism, but if the social ontology of Photoshop is any indication, our increased involvement and collaboration with technological

actants is only growing in the allocation of resources as durable translations. We must ask what varieties of collaborations we wish to sustain.

Finally this leads to the second subquestion: how might conceptions of visuality and the social ontology of human-technological hybrids effect participation in a network society? If, as I have reasoned, the visual nature of much of networked society puts a particular onus on visual technologies in participating in that society, then it would follow that a better understanding of the social ontology of that technology would benefit participation. Within the one example of Photoshop, I would posit that understanding its social ontology does benefit in our ability to participate in digital visual culture. In particular, the movement of the network being provides an important arrangement of translation hubs that help users to understand the power dynamics that are at work within the Photoshop actor-network. So for example, the novice who is feeling overwhelmed in learning Photoshop may know that there is a pervasive insider/outsider translation that may not be the most conducive to learning the software, but that there is also a strong mediator in the crowd as a vast community of users online gather in tutorial websites and Photoshop-centric blogs where they may find a more appropriate peer group. For users to know that there are many effects in photoshopping that are possible, but that their digital materiality, the digital chimeras that they foster within the human-technological hybrid, bare witness to an ethical social code of which they are a participant may effect their choices in participation. And awareness that the use of a certain software joins a user in collaboration with an array of market forces, that define and characterize much of that collaboration, but that also contribute to larger

resource formations within the technological ecology may impact their participation. These understandings of the network being discern power dynamics within the Photoshop actor-network, and any question of participation must take into consideration the power that flows through the translation hubs that structure it.

In the end, the social ontology of the Photoshop actor-network is about understanding how users perform with Photoshop. It is an investigation of the data-bodies that fill digital visual culture and are in translation with the visual technologies that created them. And about how live image visualities ask the spectators of digital visual culture to also be users of those visual actants, suspicious and mesmerized as both consumers and makers of the invisibilities that code and recode images in a technological ecology.

Chapter 6: Reflections and Recommendations

Reflecting on the Cut: On Investigating Social Ontologies

Due to the emphasis throughout this research on rhizomes, networks, and ecologies, it seems appropriate at the conclusion of the research to go back to the beginning. At a very early stage in planning this research study, I had the opportunity to see pioneer computer artist Charles Csuri speak at the OSU Urban Arts Space gallery²⁶. As part of his talk a discussion commenced concerning Csuri's (1968) *Hummingbird*, considered to be one of the first computer animations, that catalyzed my curiosity about collaborations with technological actants. Csuri recollected how the tedium of waiting for punch cards to process drove him away from animation in the mid 1960's, but the computers of today have brought him back. He described his current process of making computer art as setting parameters for the computer code to process that generates thousands of images that he then goes through to find the "right one."

²⁶ Csuri was present for an artist's talk August 26, 2010 in support of his retrospective *Charles Csuri: Beyond Boundaries, 1963-Present* at the Ohio State University Urban Art Space. The quotes and observations of his gallery talk are taken from my own field notes.

Csuri uses a programming language called AL (Animation Language), a procedural computer animation language developed by Steve May as dissertation research while studying at the Advanced Computing Center for the Arts and Design (ACCAD) at OSU in 1996, to generate much of his animation (Csuri, 2002). Csuri (1998) describes this process in his statement concerning the “infinite art object,” and it is worth quoting him at length to understand how he views his creative process,

I establish the constraints or rules at an intuitive level. I do not use a formula for visual structure, beauty or the content. I use a range of numbers setting limits to position scale, rotation angles, surface properties, camera positions, etc. My years of experience with screen and world space, lighting angles for spotlights, the camera positions and assigned behaviors all come into play. I try to visualize objects moving around the world space, changing their colors, shapes or even themselves. This involves a feel for what will work in the world space. My choice of the range of numbers has a relationship to my perception of visual structure and esthetic qualities. Some combinations are likely to work. Maybe at an imbedded psychological level the Virtual Me am [sic] aware of those Cézanne paintings and Rembrandt sketches.

The effect of this approach is that there are hundreds or there could be billions of representations of an idea. As a practical matter, I do an overnight run of only several hundred pictures. I set the initial conditions and sit back and watch for the consequences. It is the Virtual Me who is playing artist. The next morning I sort through them to select the best series or the best picture. If I try to select the best picture, I often have difficulty making a decision. Sometimes I like all of them.

Csuri uses May's AL software, but the use of AL seems to be relegated to its instrumentality, a complicated tool in the hands of the artist. The features of AL, such as setting parameters for camera angles, appear to be secondary to the intuitive process of Csuri's selection of parameter values: the software is not a collaborator. Csuri went on in his gallery talk to assert that AL's ultimate failure is in deciding what is art, because that is the artist's job.

When asked from the gallery audience about what he would teach to a current class of freshmen in college, Csuri bristles at the idea:

Students do not know how to draw...art teaching now is so focused on ideas that things like visual structure, color, going from the general shapes to the more specific have no place. (quote from my field journal, August 26, 2010)

He seems unaware that his practice is a part of a milieu that questions the relevancy of drawing as a human practice, but yet he insists that there is a lot of computer graphics and very little computer art. For Csuri, the artist, autonomous and embodied, is in control of the surplus of the visual image, that special quantity that Csuri identifies as art, and through the artist's training and understanding helps to determine this surplus through an informed intuition: as Csuri says, "you cannot make the leap without the training." However, Csuri's (2006) *Compositions*, another work in the exhibition, showcases the very tensions of locating this surplus through the artmaking process that appears so in flux in Csuri's work. *Compositions* is a computer running an image-generating algorithm that displays the image for eight seconds and then goes on to the next one. This process stretches forward perpetually, and every image is lost when the new image is created. The work is about the ephemeral, about impermanence, about art as nothing but happening, and seems to open up questions of artmaking with such sophisticated technological actants. Who is the artist in this work? Csuri? May? AL? At the core of these contradictions erupt the paradox of the autonomous artist making in digital visual culture and the

technological ecology that envelops them. From an early phase in this research, the dilemma for Csuri's work drew parallels with early cybernetics research for the ways that both areas of research trouble notions of humanist epistemology while simultaneously trying to re-inscribe that very epistemology (Hayles, 1999).

From the very outset of this research study, Csuri's paradox of making art with computers became my paradox for pedagogy. How can I articulate the complex interactions and collaborations of the post-Enlightenment subject as human-technological hybrid: as cyborg artist, as a pedagogy of visibility, and as a gateway to the opportunities of participatory culture? It was clear to me from my own teaching experiences using visual technologies with students that to ignore this articulation was doing them a disservice. By neglecting the ubiquitous technological ecology that we all inhabited, students connectivity in both spaces in and outside of schools were obfuscating the terrains of learning. By ignoring their complex multimodal practices that resulted in the materialities of digital chimera, students' opportunities to explore new media in the face of unwavering traditions of studio practice in painting and photography was stifling a new generation of exploration that needed curricular support, academic recognition, and critical rigor. From my experiences in art and computer classrooms, art education pedagogies were bypassing the opportunities of network being and instead looking to fit square pegs in round holes. Through this research, investigating visibility as a network of space and time within the technological ecology to offer deeper understandings of the social ontology of Photoshop, I have emphasized an opportunity to remediate this pathway both by how visual technologies are conceived and how critical discourse is pursued.

As an art educator, I believe a visual culture pedagogy, where visibility is central to learning inquiry, is instrumental to instruct future generations of digital natives through investigations of the visual apparatus of network technologies and our collaboration with innovative technologies within the human-technological hybrid. Vision and visibility are too much a part of the sociality of participatory culture to overlook these important contributions. Classrooms are already a part of the technological ecology, and it is time to take account of the role of these new collaborators, these actants, in educational spaces. To take account of the ways in which innovative technologies add layers of meaning to explorations of visibility by shifting focus away from conceptions of technological tools, and instead developing a more robust understanding of our human-technological collaborations.

In order to achieve this deeper understanding, this research has made a concerted effort to forward an ontological focus through the ANT methodologies that have guided much of this research. This focus on a social ontology fundamentally displaces an emphasis on the instrumentality of visual technologies for a heterogeneous gathering of actants in symmetry as users, communities, and technologies. The symmetry in focus describes my own relationship with Photoshop through a framework that *sees my performance as a collaboration with Photoshop*, and explores a network formation of Photoshop from a tool to a complex assemblage of agencies that became the Photoshop actor-network. The assemblage presented in the data chapter exemplifies my

following the actant Photoshop, in its discourse and GUI bodies, to trace the network of translations of its most forceful mediators. These mediators were determined by their force in translation, the agential interaction between two actants that changes both in a relationality, and becomes the heterogeneous gathering of the social ontology.

This account of the social ontology of visual technologies relies on a breaking apart of singular objects in the technological ecology, to assemble the complexity of a networked being that has real effects on the outcomes of any collaboration that may come from using it. This process of assemblage was further enhanced through a space-time visibility of social ontologies that sought to utilize the surplus of the visual, as an entity constructing the social, that provides insight into the powerful dynamics of translation that exist through the relational give and take of working with visual technologies. By disrupting the “black box” (Latour, 1987, p. 4) of Photoshop, seeing its complex and rhizomatic constitution, pathways to deeper investigations of power within the dynamics of pedagogy open up. Social ontologies provide nuanced trajectories out of the cul-de-sac of representation, and instead utilize the scaling of component parts to arrive at broader assemblages of social formation. Looking at Photoshop is but one example, but one component, of a new opportunity to see power dynamics that persist in innovative technologies, and that require reflexive accounting of the alliances and forces that over-determine user experience.

Central to this social ontology is the role that translations, which erupted in the data, played in characterizing my collaboration with Photoshop. These translations were analyzed using three interpretive movements meant to

encapsulate the intersections of theory between visibility and ANT: these three movements are the technological ecology, digital chimera, and network being. The movement of the technological ecology analyzed the resource formations within the network to understand its allocations of entities and the durability of certain translations. The technological ecology utilized a space-time visibility that asks moral questions of the sustainability of dominant resource formations and calls out the modest designer that lurks in the programming code. The movement of the digital chimera analyzed the data-bodies of human-technological hybrids to understand and grapple with the affordances of their digital material performances. In maintaining an ANT symmetry, these affordances of photoshopping, market forces, and ergodic involvement combined to generate a live image visibility that is a visual construction of the social that relies on coding and decoding the invisibilities of digital image manipulation practices. The movement of the network being analyzed the scale-free network structure of the Photoshop actor-network to see its power dynamics through its five translation hubs. These translation hubs code the knowledge performances within the Photoshop actor-network, and model an understanding of the human-technological collaboration as a matter of concern through the hubs of insider/outsider, crowdsourcing, innovation, market forces & copyright, and photoshopping & ethics translations. Collectively these movements were an explicit effort to utilize the intersections of theories of visibility and ANT, and to apply the ontological framework to better understand the innovations and

opportunities of network computing in a digital visual culture.

One thing to acknowledge as an outcome of the research is that the theories of ANT and assemblage theory were used as a framework to analyze visual culture studies and theories of visibility. This part of the theory building examined the role of actants within social construction, made use of visual construction within assembling the social ontology of Photoshop, and made an attempt to theorize visibilities as operations within ontological frameworks. However, symmetry between the two bodies of theory seems a bit lacking at its conclusion. Engaging questions remain about the affordances of looking at ontologies or the intricacies of seeing non-humans persist. In my reflecting upon the research, it appears that ANT has been brought fully to visibility, but perhaps future research needs to continue to endeavor to understand what it means to gaze at an actor-network.

Despite these shortcomings, what follows is a series of recommendations, that arise from this research. These recommendations come from the nuanced perspective gained by assembling actor-networks of visual technologies, and conceive of broader applications of the methodologies and findings of this research. I begin with recommendations to the field of art education and then move on to future research.

Recommendations for the Field of Art Education

Through the analysis of the three movements and the benefit of the social ontology of the Photoshop actor-network in mind, I offer some broader

recommendations for the field of art education. The research findings of following the actant Photoshop offer durable and fragile translations specific to its actor-network, but the recommendations that follow are of a more general format from the reflections that come from this research process. The movements of the technological ecology, digital chimera, and network being were conceived with broader application in mind as to their facility to combine ontological frameworks and visual culture studies in analysis. The following recommendations are given not in direct reference to the Photoshop actor-network, but rather within the understanding that the methodology of assemblage has broader application within the field of art education. The following four recommendations are conceived as the center points for understanding the affordances, gaps, and hegemonies that are assembled through social ontologies, and construct a different agenda of concern than emancipatory media pedagogies. Instead, the recommendations forefront an epistemology of collaboration when digital technological actants enter learning spaces.

1. **Understanding collaboration with technological actants in**

symmetrical relationships: Through out this research there has been an emphasis on seeing the symmetry in collaboration between actants. This is not only a contribution from ANT, but also through the understanding of visuality where the visual becomes a mediating actant in constructing the social. Recognition of this symmetry with visual technologies in the making of digital visual culture not only brings in an appropriate social

complexity through actor-network formations, but allows for a recognition of the host of alliances and affordances that come along with that collaboration. Actant symmetry is not an ideology that over-determines the productivity of working with technologies, but rather recognizes their contributions to material performance within human-technological hybrids. These data-bodies disavow the autonomous subject, yet embrace complex notions of agency that reflect mediating forces within the social ontology that constructs the world and ways of being in that world. And humans cannot be the only ones to embody agency in the world! Teachers and learners benefit from understanding this symmetry in performing with actants, not only technological ones, because the learning process as an ecology itself is composed of resource formations and durable translations that help to construct that learning space and its possibilities. By recognizing the collaboration with actants in the technological ecology, teachers and students are better equipped to ask moral questions of the sustainability of the translations that are a part of their social ontology as a learning space. They are also better equipped to understand the dynamics of power through network being, through connectivity that is fueled through the over-determine of network structure and translation hubs, and make strategic choices about their alliances in this complex technological ecology.

2. **Seeing the hidden curriculum of modest designers:** This moral question of sustainability in the learning space connects to another idea that has been used to call attention to knowledge gaps in curriculum: the

hidden curriculum. The idea of the hidden curriculum has also been associated with digital media and learning by suggesting that the lack of curriculum leveraging the affordances of social media to benefit students in a participatory culture is another form of the hidden curriculum (Jenkins et al., 2006). What the social ontology of the Photoshop actor-network makes clear is that the role of modest designers need to be acknowledged and interrogated in understanding and leveraging the affordances of any technology. All digital technology is the result of design, and, regardless of its perceived complexity, cannot be understood as beyond the scope of teachers and learners. The implications of the modest designer, through the program code, as an actant involved in translations that have strategic and political impacts should be a part of the full consideration of what students are learning when they work with visual technologies. In this sense, the modest designer is an actant collaborator in pedagogy, because the structuring of program functionality does not fully account for the market forces that pervade the technological ecology. As the example in this research of proprietary software versus free and open source software indicates, program code is a set of politics, and understanding your full participation in the collaboration must take account of this implied alliance.

3. **Rendering ethical participation in scale-free networks:** One of the outcomes of this research was the determination of the Photoshop actor-

network's scale-free network structure when translations are taken as the site of connectivity. Although it would be too presumptuous to suggest that all actor-networks exhibit a scale-free structure, there is research that suggests that important network technologies, such as the Internet, also exhibit this scale-free structure (Barabási, 2003). What is significant for this finding is that these scale-free structures exhibit certain power dynamics that provide significant coercion as to the types of knowledge performances that are a part of the actor-network. In the social ontology of the Photoshop actor-network, the powerful translation hubs of insider/outsider, crowdsourcing, innovation, market forces & copyright, and photoshopping & ethics were found to erupt over and over again in the data. A part of the power of these translation hubs is the strength of translations to erupt in a variety of actant interactions, and in schools these actants are many. Just as the Photoshop actor-network showed books, authors, software, websites, corporations, teachers, and students in complex interactions that returned to these translations hubs, so too does the gathering of actants in translation within learning spaces harbor the same potential. Recognition of these powerful hubs of translations is in how they characterize and over-determine the collaborations and material performances that the actor-network provides. Again, the symmetry of actants cannot be discounted in providing some individualized push-back to these determinations of knowledge performance, but neither can teachers ignore the power dynamics of these translation hubs when they ask students to collaborate with technological actants.

4. **Contribution of live image visibility to digital media and learning**

scholarship: A part of the investigation of the Photoshop actor-network through the intersections of theories of visibility and ANT was to bring analysis from visual culture studies to address the lack of scholarship that attends to the visual within the field of digital media and learning (Sweeny, 2010b). The introduction of live image visibility in this research is an effort to address this lack and provide the field of art education with curricular mobility as a visual culture pedagogy with theories of visibility that extend across disciplines. As the effort to create integrated learning opportunities within education takes shape across subjects in the sciences, humanities, and the arts, it is vital for the field to make contributions that extend in coordination with the digital visual culture of all subjects. Live image visibility addresses the invisibilities of the digital image that pervade all visual cultures from photographic historical records to scientific visualization. It is also the opportunity to take account of an expanding maelstrom of innovation that combines visual technologies, connectivity, and data through augmented realities that are mobile, real-time, and highly customizable. The example of photoshopping as a live image visibility is singular within this research, but possible trajectories of this line of visual inquiry include:

- Augmented reality mobile applications: The smart phone evolution has brought a number of powerful visual technologies to a broader

audience and has continued to combine layers of data with visual production that includes database cross referencing, interfacing with social media platforms, and global positioning system (GPS) location. Essentially, augmented reality apps allow you to use the camera of your smart phone to see data on the world around you in real time. Whether it is radar weather patterns in the sky above you (see *Weather Reality* for Android by Digital Cyclone, Inc.), or a first person shooter game of the world around you (see *iSnipeYou* for Android by Sense8), these mobile applications are defining new visual actants that provide different actor-networks to understand our social ontology.

- Smart video filters: These applications allow for video to be analyzed for image content and manipulated according to algorithms. This implementation of video manipulation introduces a whole new level of technological actant collaboration with video imagery that may change how we think about editing video. A fascinating example is the Unlogo application that allows for users to insert their own chosen images within video to cover up advertising and branding that is within the frame and recognized through algorithmic analysis (see unlogo.org for more).

As a visual construction of the social ontology for digital natives that combines the material performance of photoshopping, market forces, and ergodic involvement, live image visuality is an ambitious transdisciplinary investigation. These types of investigations provide insight across the

curriculum, because they pursue investigations of visibility that eclipse domains of art historical canons and popular culture, to instead construct sociality through visual actants: pervasive and innovative, murky and complex, these unsure actants are providing a wide array of opportunity for visual culture studies and art education to do its work. With this work is a sense of urgency to harness students' multimodal practices for learning (Barton, 2007; Beavis & O'Mara, 2010; Gee, 2003; Thomas, Joseph, Laccetti, Mason, Mills, Perril, & Pullinger, 2007), and makes the role of a visual culture pedagogy to investigate the live image of a digital visual culture all that much more important. Its implications for the use of visual technologies in any discipline helps to distinguish the spectatorship of posthuman subjects within the gaze of networked visual apparatus and their play within digital visual culture.

These recommendations are a result of the understandings that I have garnered from following the actant Photoshop to construct its social ontology as an actor-network through the intersections of theories of visibility and ANT. Although some particularities of this study may only be appropriate to the fragile constitution of the Photoshop actor-network, the recommendations above are intended to generalize the insights from this research to a broader application within the field of art education and across all fields of visual culture pedagogy. These recommendations are set forward as beginnings, as a starting point to engender ethical participation in networked computing in learning spaces that take full

account of the impacts of the visual construction that is a part of social ontologies.

Recommendations for Future Research

As a conclusion to this research I would like to offer pathways for future research to investigate social ontologies of digital visual culture. The introduction of the three movements that places a particular emphasis on ontological perspectives central to ANT theory and facilitates new theoretical spaces to grapple with the contributions from theories of visibility, can impact understanding and participation in a ubiquitous digital visual culture. These movements were in response to the need to understand the opportunities of digital network computing as to the ways that it continues to change “our values and norms surrounding education, literacy, and public participation” (Ito et al., 2010, pp. 1-2), present a changing “hidden curriculum” (Jenkins et al., 2006, p. 3) through the continued collaboration within human-technological hybrids, and focus on the visual as a pervasive resource of knowledge performance across disciplines. The following three recommendations for future research come as a result of this study:

1. **Focus on social ontologies:** The offerings of social ontologies to understand the complexity of being and mapping the heterogeneous gathering that construct visualities and actant interaction are immense. Pursuing understandings of the role of social construction in representation through visual culture has yielded significant findings in

understanding the postmodern subject, but to take full account of the technological ecology a more flat and local approach is required. This approach does not disavow the power dynamics of social construction, but rather also looks for ways to construct the social, in coming to a recognition of its impossible complexity, that still generates opportunities for tactics of learnings that are valuable for digital natives. Pursuing social ontologies allows for a theoretical rigor that does not deny power relationships and dynamics, but resists filling interactions in the world with a hegemony of ideological social stuff. Although, ontological frameworks are not without their ideologies, they forefront a capacity to stay close to the things in this world only to illuminate their network formation and ultimate multiplicity. This multiplicity becomes the focus of investigation as component parts are assembled into larger assemblages that then illustrate power dynamics with social formations, and resist *a priori* assumptions of social formation or emancipatory practice. It is also a recognition of the virtual capacity of immanence that characterizes the physical world (DeLanda, 2002), but has yet to be fully enunciated within social and cultural spaces through scholarship exploring the “ontological turn” (DeLanda, 2006; Escobar, 2007). Using an ontological framework can provide rhizomatic impressions of the material and knowledge that constructs the world, and thereby questions a purification of Nature and Culture as whole and separate (Latour, 1991/1993). This separation of

being is untenable, and does not allow for researchers to be in the complexity of an objectivity that is multiplied, filled with potentialities, and often irrational. Through the visual nature-cultures of social ontologies, investigations of sightedness become investigations of the eye in making and forming culture and discourse in framing the eye of vision. These possibilities emerge in the ontological framework, and it is this framework that offers great potential for qualitative researchers.

2. **Pursuing other actants:** As a part of this opportunity for qualitative researchers, especially those interested in digital media, there is a great plethora of actants to explore through the methodology of this research. My own exploration of the Photoshop actor-network was grounded in years of collaboration, but there is an ever expanding list of important actants within research that need the same attention. Possibilities include:
 - There is a need to better understand the presence of search engine algorithms as actants in collaboration with research that is rich for investigating the allocation of resources within the search ecology and investigating the modest designer of database structures.
 - There is great potential for investigating vast visual online communities that coalesce around the curation and sharing of visual cultures. Sometimes these communities gather with a maker's ethos as in Flickr and sometimes more of a remix ethos such as tumblr.com, but the methodology of this research would take a local approach to understanding how the platform, whether Flickr or tumblr, collaborates in the work of these communities. Not

only do these communities offer rich online ethnographic data for investigating the visibility of emergent behaviors of the crowd through social media, but there is the potential to see non-humans in their contribution to community formation.

- There is also a need to account for innovations in mobile technologies and cloud computing capabilities that allow users to harness on-the-go visual technologies that provide powerful control over digital visual production and sharing in ubiquitous deployment. Whether it be a focus on the connectivity of visual devices or the augmentation of visual apparatus through data, as was discussed above in relation to live image visibility, the combination of innovation, mobility, visual technologies, and connectivity is fomenting a vast array of actants that are actively constructing the socialities that constitute part of being in the world.

All of these actant interactions of users and visual technologies were a part of the Photoshop actor-network in some way: the affordances of the Google search algorithm, the community of Photoshop spectators at the blog *PSD: Photoshop Disaster*, and the version of Photoshop developed for mobile devices called Photoshop Express. The scope of this research was not able to attend to these actor-networks in the careful development of assemblage and translation analysis that was the character of my research surrounding the Photoshop actor-network. However, trends in

the technological ecology point towards these actants as powerful actor-networks of which Photoshop is just an actant in translation. Further analysis of these actants as actor-networks would yield to what extent Photoshop may be a mediator, but more importantly what other mediating agencies are a part of their actor-network formations, what powerful translation hubs emerge from their network structure, and what characteristics of the visualities that their collaborations engender have yet to be understood. Based upon the deep understanding that this research provided to the Photoshop actor-network, it is my recommendation that these actants may equally provide “risky” (Latour, 2005) and “messy” (Law, 2004b) accounts that can articulate the actor-networks of digital chimera that populate the technological ecology.

1. Seeing the Potential of Data Visualization: Lastly, the instrumental role that the visualization of data and findings played in this research is an example of the potential of seeing data visualization as a method in qualitative research. Visualization is already a well used resource in the communication formats of representing data in qualitative research, but it is my recommendation to take into serious consideration the potential for visualizations to become a part of the methodological approach to understanding qualitative data. Utilizing word clouds, creating graphics, and synthesizing separate graphics of inter-related content was an important method within this research to operationalize a visual construction of the social ontology of the Photoshop actor-network. It would be a misrepresentation of those figures to suggest that they

represent my findings, when in fact they are data-bodies that represent the processes that led to conclusions and analysis that would have been impossible otherwise. This potential of visualization for qualitative methodologies is a blossoming opportunity within qualitative research, and an area where dynamic scholarship is already taking place to leverage super computer capacities to harness massive visual data banks for visualization. Lev Manovich's Software Studies Initiative at the University of California at San Diego is a good example of current explorations of visualization as qualitative methodology (see <http://lab.softwarestudies.com> for more). Manovich's investigation of what he calls cultural analytics is a leader in conceptualizing what role visualization and visual construction of large image data sets can play in the research endeavor . The potential for visualization to take an active role in the methodological approach to qualitative research combines the force of the visual that goes beyond language and engages visuality as a research practice not just an object of research.

These recommendations are offered as insights garnered from this research and may continue to benefit explorations of the social ontologies of digital visual culture.

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At the end of this research process, I would like to conclude with one last impression. Assemblage of the Photoshop actor-network has offered to me a load of interesting theories and findings, but it has also forced me to take a closer look at my collaboration with the actant technologies in my life. As a result, I have re-evaluated the alliances that these collaborations implicate me in and taken action to re-assemblage a gathering that makes more sense for my politics and sense of ethical participation in digital visual culture. As I navigate through new free and open source technological ecologies, I am learning other actor-networks, complexities, and rhizomes that are not always easy, never perfect, and always strategic. However, as I struggle in new operating systems and fumble my way through new digital image manipulation software, I cannot help but feel that this new assemblage may offer translations that keep my conscience at ease (even if they frustrate me).

But, Photoshop and I have been friends for too long for me to abandon it completely. So I am sure it will find its way back into my habits of digital making. Even if I have to borrow a copy!

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Appendix A: User's Manual

A Short Glossary of Terms

Due to the theoretically exploratory nature of the dissertation question, there are a number of terms that reference unique combinations of conceptual ideas. To aid in the reading of the research I am providing the following list of terms as a user's manual. Some readers may find it helpful and some readers may ignore it as they might any user's manual.

actant

A term taken from literary theory, actants, as used in actor-network theory (Latour, 2005), are human and non-human actors contributing to the social formation and the dynamics of the network that is formed.

digital chimera

Digital chimera references the constellation of entities that fundamentally combine data (information) and the body. The term itself comes from a referential metaphor of the chimera, both mythical and biological, which combines different beasts or DNA code. Digital chimera is both a thing as a data body and a movement of analysis, as used in Chapter 5 of this research, to bring posthumanist perspectives to the social ontology of Photoshop.

ergodic involvement

A phrase coined by Espen Aarseth (1997) in his book *Cybertext: Perspectives on Ergodic Literature*, ergodic involvement refers to a reader's nontrivial effort to follow the linkages in digital text that require the reader to be involved in selecting pathways through the work. Aarseth's original text focuses on forms of ergodic literature, but the concept has been taken up by game theoreticians to better understand the types of ergodic involvement that are involved in video game play (see Calleja, 2007).

flat

Flatness, flattening, and flat topologies are used as conceptual frameworks that partially characterize the ontological perspectives that are forefronted in certain movements within the social sciences such as assemblage theory (DeLanda, 2006) and ANT (Latour, 2005). The concept of flatness de-emphasizes conceptions of hierarchies or nesting in perceptions of social formations. Instead, flattened space takes account of the small (local) and large (global) at once within perceptions of a sociality characterized as networks.

General Image Manipulation Program (GIMP)

GIMP is a freely distributed graphical editing program started by Spencer Kimball and Peter Mattis while graduate students at the University of California at Berkeley in 1996. The software has been built through a wide range of contributions from its user community that takes advantage of its open source code distribution.

Graphical User Interface (GUI)

A GUI is a type of computer interface that allows users to interact with electronic systems using images instead of text commands. Developed at Xerox PARC in the Xerox Alto personal computer in 1973, the GUI is now a dominant model of user interfaces in such electronics as computers, smart phones, and gaming systems.

live image visibility

Live image visibility addresses the invisibilities of the digital image that pervade all visual cultures from photographic historical records to scientific visualization. It is an opportunity to take account of innovations that combine visual technologies, computer network connectivity, and data through augmented realities that are mobile, real-time, and highly customizable. Live image visibility is an important concept within this research as one possible outcome of the intersections between social ontologies and theories of visibility in visual culture studies. Live image visibility is a framework to understand digital visual culture through the analysis of digital material performance, market forces, and ergodic involvement.

modest designer

The modest designer is my remix of the “modest witness” (Haraway, 1997) persona which is a reminder of the constructed exclusionary politics of Enlightenment rationality that propelled scientific method. Haraway’s modest witness critiques the historical trajectory of scientific practices that barred participation of women and people of color through social inequities and bias, and in a parallel problematic a modest designer lurks in the development and institutions of digital computing and computer graphic histories. The concept of the modest designer is a similar reminder: behind the GUI curtain there are actants and the attachments that come with (non)human constructions of knowledge. The modest designer is an acknowledgement of the constructed nature of databases, algorithms, and the ever-present non-neutrality of computer code.

network being

Network being is the focus on ontological frameworks for understanding the sociality of living with and in the ubiquity of network computing. As a movement of analysis, as used in Chapter 5 within the research, the network being provides a way of perceiving the technological and non-technological networks of a social ontology through the interconnectedness of translation, and to better understand the relationships of power within the scale-free connectivity of the actor-network.

technological ecology

The technological ecology (DeVoss et al., 2009) is a way of looking at the proliferation of digital technologies and computers in contemporary society. As an ecological metaphor, the technological ecology considers technologies as relational entities that form alliances and utilization of resources in particular ways determined by the ecosystem. As a movement of analysis, as used in Chapter 5 of this research, it explores understandings of current technologies as interrelated entities and in particular looks to understand what concepts of sustainability bring to current theories of technology in society.

translation

Translation is used in actor-network theory to reference a relational effect between two or more actants (Brown & Capdevila, 1999; Callon, 1986; Latour, 2005). This relational effect can be any number of changes or shifts, but essentially the idea of translation is the moment of interaction that is conceived through the co-constitution of human and non-human forces.

scale-free network

A scale-free network is an articulation of networks that are organized around highly connected nodes that garner more connections (Barabási, 2003). The topological characteristics of a scale-free model indicate that network formation is based on growth and preferential attachment with the underlying principle being that nodes in the network that have more nodes attached tend to be preferred. The essence of a scale-free network results in nodes that function as major hubs of connection within the network.

social ontology

A social ontology (DeLanda, 2002; Escobar, 2007) is the analysis of sociological entities through ontological concepts that include flatness of space, scaling of component parts, and assemblage. Social ontology asserts a fundamental understanding of the world as existing outside of the ways that it can be perceived. This realist ontology insists on a symmetry between human and non-human entities within social formations, and presents a new array of opportunities for sociological analysis that can be seen in approaches such as

assemblage theory (DeLanda, 2006) and actor-network theory (Latour, 2005).

symmetry

Symmetry is an important concept in actor-network theory that sees the agency of non-human actants as equal to human agencies within sociological analysis. The new status of the non-human, first suggested by Bloor (1976) and then elaborated by Latour (1987), applies a *symmetry* to both humans and non-humans in their agentic possibility within the effects of social connectivity.