Un/Becoming Digital: The Ontology of Technological Determinism and its Implications for Art Education

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Introduction

Artists have been experimenting with analog and digital technologies since the 1960's; early examples include Billy Klüver's Experiments in Art and Technology (E.A.T.) and Nam June Paik (1966). While countless artists have since made highly innovative use of new media such as the computer, artificial intelligence (AI), biotech, the Internet and the World Wide Web, LED, motion capture, gesture tracking, GPS, open source, and robotics, artist/theorists such as Penny (1995), Lovejoy (1997), Weibel (1996; 2001) and Wilson (2002) have cautioned against appropriating deterministic engineering models underlying such technologies.(1)These models, predominant in commercial industry, government and the military, embrace efficiency, commodity economics, innovation, progress, and privileging explicit (as opposed to ambiguous and metaphorical) knowing. However, each of these artist/theorists has acknowledged the extreme difficulty artists have when attempting to critique or distance themselves from the institutional values embedded in the technologies themselves.

As a result, according to Weibel, most media artists "become voluntary victims within the mighty text of technology. They celebrate their own fascination with fetish technology instead of developing a

distance to this fascination" (Bartha, 1996, p.10; Wilson, 2002). In other words, it is an uncritical acceptance of technology, rooted in a utopian determinist perspective, and the technology's "intended" purpose that instigates and drives the work's creation, not the artist's exploration of technology as a social and cultural phenomenon–the work is ultimately a showcase of the technology itself. This technological imperative is reflected in the curriculum of many art educators who incorporate digital technologies (primarily computers and the Internet) into their teaching in that their curriculum is technique oriented and technology-driven, often focused upon teaching students how to use certain computer packages and peripherals (Freedman, 1997). I have seen evidence of this at the annual state art education conventions I have attended, in that the vast majority of the K-12 art teachers' presentations on digital art in their classrooms center around the particular software packages they have taught their students how to use. The student artwork they almost always choose to display is meant to showcase their students' mastery of the software, as opposed to their students' exploration of an issue or idea.

It is true that artists throughout history have experimented with the technologies of their time; in addition, it is not uncommon for art educators to focus almost exclusively on technical proficiency and skill acquisition with beginning students regardless of the medium being used. What makes computer technology different from other media in this regard is that hardware and software generally become "obsolete" roughly every eighteen months, theoretically requiring artists to constantly re-learn a skill set, which in turn forces them to continuously engage in skill acquisition at the expense of experimentation and investigation. This dynamic is present in the curriculum of art educators who teach computer graphics, in that they must search for a "delicate equilibrium between artistic expression and technological proficiency" (Eber, 2000, p. 920). The challenge for art educators is to devise ways to

include in their curriculum the discussion of issues raised by information and communication technologies themselves, such as "planned obsolesce"; the relationship between technology and culture; technological narratives of progress and revolutionary change; technology's impact on our perception of self, the body, and identity; and technology's impact on perception, representation and thought, to name a few.

A second but no less important challenge is for art educators to engage students in critical inquiry about new media technology while remaining at basic levels of instruction as they are becoming acclimated to new technological art forms. The art educator (as well as the students) must also examine the desire to use the newest and most powerful computer technologies, a desire fed by futurist (and seductive) deterministic discourse touting the "impact" of the digital "revolution," and thus shift their focus onto meaning and content. When I refer to meaning and content, I am not necessarily alluding to critical investigation of mass media images, although this is a valuable activity in its own right. Instead, I am alluding to a critical interrogation of the assumptions and myths about technology perpetuated by industry, as well as placing technology and media within larger cultural trends. I feel it is certainly possible for the art educator to use works in which the artist interrogates technology that are enjoyable and compelling as well as approachable as a vehicle for demonstrating to students how to analyze their relationship with specific technological apparatuses and processes. Requiring the students to engage in interpretive and critical thinking about their perceptions about and interactions with technology ought to be the means toward the end of artistic production.

This essay is divided into two parts. In the first part, I begin with an overview of a range of deterministic perspectives on technology, such as utopic, dystopic, and critical/contextualist. I then describe how these perspectives have shaped discourse on Internet technology in

general, in education, and in the art classroom. In the second part, I focus more narrowly on the Internet and artists who use the World Wide Web (WWW) to create their work, instead of approaching technological and digital art more broadly. I have two reasons for doing this. First, Web art, in comparison to other forms of digital art in which the artist utilizes technologies such as motion sensors, AI, biotech, or robotics, for example, is generally more accessible to K-12 students if they are enrolled in a school equipped with one or several computer labs and Internet access. Second, I focus on Internet art because Internet technology has been the subject of much deterministic discourse, both utopic and dystopic. The artists I have chosen include British "artivist" Heath Bunting, Web artist Andy Deck, and telepresence artist Eduardo Kac. The reason I have chosen these artists is that they each use the World Wide Web as a means to interrogate Internet technology as a social/cultural practice, as well as address specific issues pertaining to Internet technology, such as the rhetoric of power and "newness," collective action and collaboration, the nature of interactivity, and what it means to "know at a distance." I conclude this section with a discussion on how an art educator might use the work of these artists to introduce the aforementioned issues into their curriculum and critically examine popular, determinist views of technology.

Visions of Technology

Both utopian and dystopian perspectives of technology reflect a particular technological determinism that positions technology as a determinant of social forms and processes. In other words, technological determinism is molded by a set of narratives that presume "new" technologies impact (positively or negatively) directly upon society, replacing what has come before, and producing a predictable set of effects regardless of the unique specificities of time and place (Bingham, Holloway, & Valentine, 2001). What is missing from technological determinism, according to Thrift (1996), is "any concerted sense of new

electronic communications technologies [such as the Internet] as part of a long history of rich and often wayward social practices (including the interpretation of those practices) through which we have become socially acquainted with these technologies" (p. 1472). The dilemma of technological determinism, according to Castells (2000), is a false problem because technology *is* society [emphasis his] and society cannot be represented without its technological tools. Technological determinism is often conflated with social determinism because socio-cultural determinism sometimes leaves as little room for individual agency as extreme technological determinism leaves to social control (Chandler, 1995a). In addition, more extreme versions of technological determinism ignore the interpretive processes that emerge when humans become socially acquainted with technologies, whether through their design and manufacturing, or their use in the home or workplace.

Utopian Visions of Technology

Barbour (1993) characterizes the optimistic appraisal of technology under the notion of "technology as liberator." Throughout modern history technological developments have been welcomed for their potential for liberating humans from hunger, disease, and poverty, and celebrated as the source of material progress and human fulfillment. In addition, technological fixes have been sought for social problems brought on by technological developments, rather than trying to change human behavior or forge a consensus on political policies. Therefore, the position of "technology as liberator" is particularly familiar in the West. Barbour explicates the technological optimist's position by outlining four kinds of benefits instigated by technological development:

1) Higher living standards brought about by new drugs, better medical attention, improved sanitation and nutrition, and machines releasing us from backbreaking labor.

2) Opportunity for choice regarding social and geographical mobility; power over nature that gives greater opportunity to exercise human freedom.

3) More leisure due to the development of laborsaving devices that free us to do what machines cannot.

4) Improved communications offering the possibility of instant worldwide communication, greater interaction, understanding and mutual appreciation.

Feenberg (1991) refers to the notion of technology as subservient to values established in other social spheres as "instrumental theory" (p. 5). This theory is based on the premise that technologies are socio-politically neutral, universal tools without evaluative content, ready to be put to either good or evil use via their users, inferring that technology as pure instrumentality is indifferent to the variety of ends it is used to achieve. From this theoretical perspective, technology appears detached from politics, particularly with respect to capitalist and socialist societies. The socio-political neutrality of technology is attributed to its "rational" character and embodiment of universal truth in that it is based on verifiable causal propositions. Instead of being relative, technology, like science, maintains its cognitive status and norms of efficiency in all social contexts. Also, this universality implies that identical standards of measurement can be applied in different settings, such as increasing the productivity of labor in different countries, eras, and civilizations.

The instrumentalist understanding of technology also advocates an unreserved commitment to technology's use. This does not mean that an instrumentalist would never make exceptions and refuse to use specific devices out of deference to moral values. However, the

notion of "trade-offs" is central to instrumentalist thinking: ethical, religious or environmental goals can only be achieved at the expense of efficiency. Thus the technical sphere can be limited by non-technical values, but not transformed by them (Feenberg, 1991).

Dystopian Visions of Technology

Ferre (1995) describes the dystopian perspective as "somber visions [of technology]" (p. 63), Barbour (1993) as "technology as threat" (p .10), and Feenberg (1991) as "substantive theory" (p. 7). Ferre refers to Martin Heidegger as representative of one with a somber vision, although he cautions that Heidegger's thought cannot simply be read as "anti-technological" despite his warnings and grim view of technique. The primary question regarding technology, according to Heidegger (1977), is "what it is" (p. 4): an end-seeking human activity that uses equipment, tools, machines and the like to achieve those ends. Such an "instrumental and anthropological" (p. 5) definition postulates that technology is a mere means, something that is manipulated toward practical ends and contained within human mastery.

However, modern technology challenges this view because it is "something completely different, and therefore new" (Heidegger, 1977, p. 6) in that it demands the extraction of energy from nature for storage and manipulation at will and has a much more intimate relationship with modern science than older forms of technology. From this Heidegger derived the notion of the technological a priori, which is not itself a machine or anything overtly technological, but a machine way of thinking that allows nature to be approached as something to be mechanized, reducing it to a manipulable standing reserve for ordering and regulation. As the will to mastery itself, the danger of the technological a priori lies in our efforts to control modern

technology: the more we will to master it, the more it masters us through the technological quality of our act of willing.

Those who perceive technology as a "threat to authentic human life" (Barbour, 1993, p. 10) consider technology inimical to human fulfillment. The human costs of technology are many, including mass society's push toward uniformity: standardized products created via mass production, mass uniform culture produced by mass media, homogeneity promoted via industrialization. Technology promotes narrow criteria of efficiency leading to rational and efficient organization, requiring fragmentation, specialization, speed, and the maximization of output; the criterion is efficiency in achieving a narrow range of objectives. Relationships in a technological society tend toward specialization and functionality, utilizing technology for subtle yet insidious and pervasive forms of manipulation, surveillance and psychological conditioning. Technological pessimists also cite technology's uncontrollability as an interlocking system or mutually reinforcing network that leads a life of its own, no longer a set of adaptable tools for human use, but rather an all-encompassing pervasive structure with its own dynamic and logic. Barbour (1993) refers to the work of French philosopher Jacques Ellul (1964), who argued technology is an autonomous and uncontrollable force that dehumanizes everything it touches.

Feenberg (1991) also refers to the work of Ellul and Heidegger to illustrate the substantive theory of technology. Substantive theory argues technology "constitutes a new type of cultural system that restructures the entire social world as an object of control" (p. 7; Winner, 1986). This system is embodied by an expansive dynamic that mediates every pre-technological enclave, shaping the whole of social life, and the only solution to this dilemma is retreat. Feenberg (1991) explains how Ellul linked the rationalization of society with technology by arguing that technical phenomena has become the defining

characteristic of all modern societies regardless of political ideology. What substantive theory tries to make people aware of is the cultural character of technology, i.e., through our decision to use particular technologies we unwittingly make certain cultural choices. Technology is not only a means to an end, but an environment and a way of life: this is its "substantive" (Feenberg, 1991, p. 8) impact.

Utopian Visions of the Internet

Much theorizing about cyberspace and the Internet in academia and the popular press characterizes either the utopian perspectives or the dystopian perspective in that both share a technological determinism representing cyberspace and the "real world" as distinct, unconnected, and possessing different, often oppositional qualities (Doel & Clarke, 1999; Holloway & Valentine, 2003). Technological optimists conceive the "virtual" as "improving" upon the "real," and cyberspace as holding promise for all global citizens. Technological pessimists view cyberspace as a threat and the "virtual" as an inauthentic, poor imitation of the "real." These two views are constructed within a discourse of disembodiment, disregarding the embeddedness of on-line activity within the context of offline spaces and the social relations of everyday life (Holloway & Valentine, 2003).

For instance, Hayles (1996) has pointed out that cyberspace has been heralded by technological utopians as a disembodied medium that offers transcendence from the material body and worldly environments. This opportunity to leave one's body and its accompanying racial and cultural markers also enables users to "try on" various identities (Plant, 1996; Turkle, 1995) in an atmosphere inhospitable to discrimination and prejudice. Technological optimists trumpet new forms of social interaction the Internet makes possible: global users meeting mind-to-mind, unconstrained by geographical

proximity. They argue such relationships are potentially more intimate and rich compared to "real life" friendships because they are based on genuine mutual interests. Finally, cyberspace has served as a source of inspiration for optimistic promoters of globalism and global capitalism, particularly those who perceive the Web as ushering a new human condition. In a 1996 interview with Wired contributor Kevin Kelly, Derrick de Kerkhove, head of The McLuhan Program in Culture and Technology, describes the Web as a "new guise of language" (p.6) in a tribal world where the cosmos "has a presence. It's alive. The tribe shares in this huge organic reality" (ibid.). He continues with

> the agenda of the Web is that of a tribal chieftain: the language is shared, not imposed…The screen is the collective shared image. The content of that screen is a collaboration of zillions of synaptic connections. That's what the Web is for me, it's so close to a mind (p. 6, 7).

Technological optimism has also found a home in discourses on education. Some art education theorists (Marschalek, 2001; Taylor & Carpenter, 2001) and classroom art educators (Halsey-Dutton, 2001) have claimed that communication technologies such as the Internet will transform teaching and student learning, precipitating a major shift in pedagogy as well as how schools and universities operate. Digital technology, the Web in particular, has been seen by educational reformers as a technocratic solution to "problems" of education by offering access to enormous amounts of writing and visual materials from all over the world (Sefton-Green & Reiss, 1999). This solution is based on two assumptions: a) people do not have enough access to information or are bereft of information, and b) information is knowledge (Bromley, 1997; Winner, 1986).

Technological optimists center computers in discourses regarding the purpose of education: preparing students for effective participation in knowledge-driven information economies (Bryson & de Castell,

1998). While technological optimists argue that all children must acquire so-called "necessary" technological knowledge now deemed invaluable in the workplace and academia, optimistic visions of educational technologies construct computers as autonomous tools that are educationally valuable only when distinctions are made between certain computer-based pedagogical activities, such as "drill-and-practice" software and online games on one hand, and "learning environments" on the other. For example, some educators have championed the nonlinear design of interactive multimedia programs and the Web as enabling students to become active participants in their own learning rather than passive observers and consumers of meaningless and irrelevant facts (Gregory, 1996). Multimedia learning environments have also served as an example of student-centered constructivist pedagogy that facilitates higher-order thinking skills through self-directed activities such as gathering information, solving meaningful problems, communicating with others, and constructing their own knowledge of the world (Parrish, 2000). This constructivist view could be characterized as a "soft" technological determinism that allows some scope for human control and cultural variation, claiming that "the presence of a particular technology is an enabling or facilitating factor leading to potential opportunities which may or may not be taken up in particular societies or periods (or that its absence is a constraint)" (Chandler, 1995b, p.8; Finnegan, 1988, p. 38).

Bryson and De Castell (1998) caution against positing a direct relationship between children's acquisition of "higher" forms of thinking and use of particular learning styles such as metacognitive thinking and their engagement with certain computer programs and/or environments. They argue that such rhetoric on "thinking styles" and "learning styles" often glosses over socioeconomic inequities by "creating essentialist ontological categories out of what are far more plausibly seen as vastly unequal access to power in school" (p. 72).

This optimism does not sufficiently acknowledge sociopolitical differences amongst learners and resultant inequitable relations to educational technologies, thus severing these technologies from the normative contexts of social practice in which they are used.

Dystopian Visions of the Internet

Just as there have been Internet enthusiasts, there have been detractors ranging from cautionary to hostile. Implicit in their arguments is the assumption that a state of being exists independently of technology, attributing technology with a certain level of autonomy and self-propelling logic (Kendrick, 1996). For example, information technologies are seen as challenging the status of human subjectivity (Barglow, 1994) by fostering a worldview that privileges analytical thinking over holistic forms of understanding (Robins & Webster, 1999), making possible new metaphors linking functions of mind to the function of machines, or likening students to information processing apparatuses. Postman (1992) explains we have "relinquished control, which in the case of the computer means that we may, without excessive remorse, pursue ill-advised and even inhuman goals because the computer can accomplish them" (p. 114). On-line communication and interaction is regarded as distinct and less authentic than the complex human engagements occurring in the off-line world (McLaughlin, Osbourne, & Smith, 1995). At the same time, Internet users have been portrayed as withdrawn, overly attached to on-line culture, neglectful of their social and physical surroundings and "real-world" obligations (Kraut, Patterson, Lundmark, Kielsler, Mukophadhyah, & Scherlis, 1998).

Children's Internet use has also alarmed technological pessimists who feel it puts their physical and emotional well being at risk. Some commentaries have painted the computer as the new "electronic babysitter," replacing television as detaching children from friends and

family, keeping them indoors and immersed in their own private on-line worlds. The Internet has also been portrayed as dangerous for children, making pornography, neo-Nazi hate sites, sexually explicit discussions, and forms of racial and ethnic hatred too accessible. In addition, children's Internet use has prompted fears that they are easy targets for pedophiles, dangerous strangers, child-sex tourism and child-sex abuse (Sardar, 2000). Holloway and Valentine (2003) explain such discourses are problematic because they essentialize childhood (i.e., "angelic child," "dangerous child"), deny children their status as social actors, and rely on deterministic understandings of communication technologies.

Critical Perspectives of Technology

Feenberg (1991) and Barbour (1993) have each offered a third way of looking at technology that serves as an antidote to technological determinism. Barbour refers to this third position as "contextualist" (p. 21), a position that perceives technology as neither inherently good nor evil but rather an ambiguous instrument of social power whose consequences depend on its social context. Contextualists believe that as social constructions, technologies are seldom if ever neutral because particular values and purposes, as well as social goals and institutional interests are already embedded in their design. Choices exist regarding how the technologies are designed as well as deployed. In other words, there is no "one best way" to use or design a technology; thus designers and users should explore the various choices available to them.

Although contextualists tend to criticize technology in a manner similar to pessimists (Barbour, 1993) they differ in that they are willing to offer hope that technology can be used toward more humane ends, either by political measures or changes in the economic and political system. Contextualism allows two-way interaction between technology

and society; it does not frame technology as an actor upon culture, nor does it single out cultural forces upon technology for scrutiny. Barbour (1993) also contends contextualists are more likely than optimists or pessimists to privilege questions of social justice when evaluating technology because they interpret it as both a product and an instrument of social power. Conflicts concerning technology must be resolved in the political arena, while technology itself must be redirected toward the realization of specific, commonly agreed upon human values (Barbour, 1993).

Feenberg (1991) proposes a critical theory of technology, a course of action promoting the invention of a politics of technological transformation. This theory analyzes new forms of oppression brought about by modern industrialism, argues they are subject to new challenges, and attempts to explain how modern technology can be redesigned to adapt it to the needs of a freer society (p. 13). The critical theory of technology has in common with substantive theories the notion that technology is more than the sum of its tools and "enframes" the world in an autonomous fashion, but it denies that modernity is ultimately exemplified by atomistic consumer culture. Like instrumentalism, the critical theory of technology rejects Ellul and Heidegger's fatalism, proposing that the choice of civilization can be affected by human action, and political struggle can influence technical innovation. Unlike instrumentalism, it rejects the neutrality of technology, positing that the values and interests of elites are installed in the design of any technology even before it is assigned a goal. Critical theory also argues that technology is not a "thing," but an "ambivalent" (p. 14) process of development suspended between different possibilities; therefore, technology is situated as a scene of struggle, a social battlefield rather than a destiny. Finally, Feenberg (1991) argues that contemporary society possesses a suppressed potentiality for a "coherent civilizational alternative based on a system of mutually

supporting transformations of social institutions, culture and technology" (p. 18).

Art, Technology, and Social Practices

I now turn to three examples of artwork and cultural activism facilitated by Internet technology: Heath Bunting's *King's Cross Phone In* (1994), Andy Deck's *Lexicon* (2002), and Eduardo Kac's *Teleporting to an Unknown State* (1996/2001/2004). While the meaning and intent of each work differs, what they all have in common is that the social practices and modes of communication made possible by the Internet are integral to the work. In addition, each work demonstrates how artists are able to educate and challenge viewers regarding commonly accepted assumptions about the use of specific, albeit ubiquitous technologies. Not only does each piece demonstrate how Internet technology has changed social, aesthetic and political practices, representation, and patterns of communication, each also demonstrates how cyberspace and "real life," despite the exhortations or lamentations of technological determinists, are not separate from each other. These two modes of being do not represent a disjuncture in human existence; they are woven together and negotiated meaningfully by people who choose to engage with them.

King's Cross Phone-In

Heath Bunting's earliest Internet project *Kings Cross Phone-In* (1994), is an example of art that facilitates the collision between physical public space, everyday life and communications technology. The project involved Bunting's creation of a Web page listing the phone numbers of thirty-six phone booths around London's King's Cross train station. The crux of the work was Bunting's use of the Internet to publicize an event that could only occur if the online "audience" participated. Having publicized his project on Usenet newsgroups alt.cyberpunk

and alt.artcom, as well as artnet and cybercafe electronic bulletin board systems, he includes instructions and an explanation for individuals perusing the page: "During the day of Friday 5th August 1994 the telephone booth area behind the destination board at Kings X British Rail station will be borrowed and used for a temporary cybercafe. It would be good to concentrate activity around 18:00 GMT, but play as you will." After listing the phone booths' telephone numbers on the same page, Bunting invites people to:

(1) call no./nos. and let the phone ring a short while and then hang up

(2) call these nos. in some kind of pattern (the nos. are listed as a floor plan of the booth)

(3) call and have a chat with an expectant or unexpectant [sic] person

(4) go to Kings X station watch public reaction/answer the phones and chat

(5) do something different

The project was successful, as random telephone calls created an auditory intervention disrupting the daily routine of an urban transportation hub as commuters passing through the station chatted with strangers around the world calling to say hello (Greene, 2000; Greene 2004). The function of networks was configured on the level of a friendly phone call, while public space was reconfigured aurally and socially (Greene, 2000; Greene, 2004). One could argue that Bunting draws upon a logic fostered by the Internet, the creation of a networked communications environment accommodating multiple participants simultaneously, and expands upon it using an individualized medium such as the telephone. *King's Cross Phone-In* reconceptualizes the public phone booth not just as an instrument for personal one-to-one conversation, but also as a conduit for engineering encounters between members of a worldwide public. In a real sense, Bunting is grounding

and intertwining two worldwide communications networks (the Internet and the telephone) within a specific local context.

The phone-in, despite the distance and anonymity between participants, in principle constitutes a collective act through individual actions (i.e., phone calls) due to their simultaneity. Although the callers do not know whether they are the sole followers of the artist's instructions, or even if they are contributing to an intervention in public space, they act in the belief that their individual, solitary action is part of a greater pattern. Here an individualist medium such as the telephone becomes a medium of collectivity, both in the imaginations of its participants and in the local context of *Kings Cross*, where a chorus of ringing telephones created a localized disruption by drawing upon an absent and scattered "community" (Berry, 1999).

Lexicon

Lexicon (2002a), an open-source software piece by Andy Deck, uses the programming language Java to facilitate user participation and interaction. Integral to the piece is the open-source philosophy of transparency: software source code belongs in the public domain, subject to public review, manipulation and development. The visitor is able to interact with the work in several ways, by creating programmatic images and/or writing scripts that affect what other users experience when they traverse through the site. The work contains a *Lexicon* vocabulary page in which the viewer is presented with sixty-eight buttons, each containing a different word, from "action" to "zap." The words are alphabetized, and all letters of the alphabet are represented. Every one of Lexicon's visual effects and transitions is linked with a word. To create an image on a "canvas," the user puts together a combination of these words, which generates an interactive montage that changes every time the user clicks the mouse. The word

combination is recorded on another page within the site; a hyperlink represents the date and time at which the combination was created, and future users are able to click on this hyperlink to generate another visual interpretation on the canvas. In addition, there are pages within the work that display the definitions of each of the sixty-eight words, as well as pages that display the source code associated with each word. Users who are familiar with the Java programming language can add to *Lexicon's* vocabulary or change the visual effects generated by existing words using what Deck has called the Lexicon Development Kit (LDK), thus enabling them to increase the number of words available for other visitors to use when engaging with the site.

Deck created *Lexicon* as a means to explore notions of public creativity and cyberspace performance, as well as exploring ways to balance "the image between the time-honored practices of written narrative and the often frustrating dominance of programming codes in digital media" and offering a "live telematic medium for communication and verbal-visual communication" (Deck, 2002b, pp.6-7). His ultimate aim, however, is to create Internet artwork that illustrates the need and the possibility for the average Internet user to shuck their feelings of helplessness in the face of market forces and contribute to a more open and independent media. Deck, a strong proponent of open source, is concerned with the increasing amount of control the entertainment and marketing sectors have over the Internet's infrastructure software, distribution technologies and content formats. He argues that corporate interests are threatened by the development of free alternatives such as Linux and Java, and software giants such as Microsoft are engaging in the process of "retrofitting" Internet software to suit their ideological and commercial agendas (Deck, 2003). Microsoft, for example, discontinued its support for the Java language in 2004 due to the fact that Java enables programmers to develop software for Windows users while simultaneously offering software to users of other

operating systems. As a result, computer users are coerced into using the Windows operating system (Deck, 2003).

Teleporting an Unknown State

Teleporting an Unknown State can be described as a biotelematic interactive installation that merges computer-based telecommunications with biological processes, metaphorically transforming the Internet into a life-supporting system. The installation consisted of a darkened room with a pedestal covered with a mound of earth containing a single seed. A video projector was suspended above and faced the pedestal, through which remote individuals sent light via the Internet, enabling the seed to photosynthesize and grow. Viewers were unable to see the video projector itself; they were only able to see its cone of light projected through a circular hole in the ceiling, not unlike a ray of sunshine breaking through clouds. Anonymous individuals worldwide pointed their digital cameras skyward, using free videoconferencing software to re-emit photons through the projector in the gallery, transmitting sunlight onto the seed. The slow process of growth of the plant was then transmitted live via the Internet for the duration of the exhibition. The graphical interface of the work was projected directly onto the bed of earth on the pedestal, enabling direct physical contact between the seed and the photonic stream (Kac, 2000).

Three versions of this work were exhibited between 1996 and 2001. The first version was shown at the New Orleans Contemporary Art Center as part of the SIGGRAPH Art Exhibit "The Bridge," which took place between August 4, 1996, and August 9, 1996. The second version was exhibited at the KIBLA Art Gallery, in Maribor, Slovenia, from October 24, 1998, to November 7, 1998. What made this version different from the first version is that it was realized on the Web, in which

participants activated a global network of webcams directed skyward from eight regions of the Earth: Slovenia, Vancouver, Paris, Moscow, Chicago, Tokyo, Cabo San Lucas, Mexico, Mawson Station, Antarctica, and Sydney, Australia. As remote participants interacted with the work, the piece's web site was projected onto the soil piled on the gallery floor. These participants would click on a portion of a 3 by 3 grid representing the eight locations on the site, resulting in the dark areas on the site gradually lighting up. Live still images from the different locations displayed the sky, capturing the sunlight. The live stills projected by participants faded to black after sixty seconds, enabling other online participants to interact with the work (Kostic, 2000).

The central image, showing the projected webcam views, was captured and uploaded automatically with a self-contained camera server. When projected, this image concentrated the light sent by Web participants and projected it onto the seed. The eight surrounding images were automatically captured by the KIBLA server from webcams around the world and made available every five minutes. One of the benefits of webcams is that while they make global information sharing of live still images possible, they do not require highly sophisticated technology, and Kac was able to avoid problems of slow transmission telephone lines in several parts of the world (Kostic, 2000). A third, highly similar version of this work was exhibited at the Austin Museum of Art in Austin, Texas in November, 2001.

What all three versions of the work have in common is that they each foster a sense of community and collective responsibility without any verbal exchange. The collaborative action and shared responsibility of anonymous individuals around the world, enabling photons from distant countries and cities to be teleported into a gallery, makes possible the birth of a fragile and small plant (Kac, 2000). This piece demonstrates a dramatic reversal of the regulated unidirectional model imposed by broadcasting standards and the communications industry. Instead of

transmitting a specific message from one point to many passive receivers, *Teleporting an Unknown State* enables remote individuals to transmit light to a single point in a gallery space. What this work makes evident is an ethic of Internet ecology and social network survival through a distributed, collaborative effort and shared responsibility. During each show, photosynthesis depended on remote collective action. Birth, growth, and death on the Internet form a horizon of possibilities that unfolded as participants dynamically contributed to the work and made possible the survival of the organism (Kac, 2000).

Implications for Art Education

The purpose of this final section is to discuss how an art educator can use the three Internet art works I have presented to facilitate students' awareness of how deterministic perspectives have shaped, and continue to shape, their perceptions of and relationship to new media technologies, the Internet in particular. I have chosen two persistent, utopian perspectives regarding computer technology, the tropes of "progress" and the rhetoric of the "new," and the "radical," "revolutionary" potential of interactivity. The first highly pervasive and powerful perspective regarding computer technology emanating from the hardware and software industries is the necessity of remaining up-to-date and keeping up with technological progress. The implication for art and art educators is that this focus on the constant development of new tools can entrap them in a cycle of continuously purchasing new equipment and spending an inordinate amount of time learning new software. Beneath this implication is another, more insidious implication: it is only possible to make "good" art if you use the most up-to-date technologies. By extension, using out-of-date equipment to create works of art is the equivalent of using crayons and tempera paints. In my view, *King's Cross* refutes this perspective very well. This is a work which makes innovative use of what we would consider a

relatively "low-tech," rudimentary and commonplace technology, the telephone, in conjunction with a website which would most likely be considered downright "primitive" by current standards. It could lead one to ask: should an artist use the most sophisticated technology available to them? To what degree should an artist who uses a particular technology push it to its limits? Should the artist's technological prowess be used as a measuring stick to determine the work's success? Is an artist obligated to learn as much as they possibly can about a particular technology as a prerequisite to using it to create their artwork?

Another pervasive determinist perspective associated with computer based media is the "radical" and "revolutionary" potential of interactivity, with proponents pointing to artworks which invite viewers to engage in some action (navigating through a menu, clicking a mouse) to influence the flow of events or to navigate through cyberspace. Contemporary youth take for granted certain forms of conventional media interactivity, such as video games; however, it is less likely that they have thought to question the nature of this interactivity. Conventional interactivity has its roots in the disciplines of human-computer interface design and engineering, premised on efficiency, productivity, and the manipulation of objects. Ultimately, the user does not have any impact on the final outcome; nor is s/he required to make any truly meaningful choices – choice is an illusion. All three works challenge the notion that interactive systems are inherently or automatically revolutionary by creating more open-ended systems dependent upon individual and collective responsibility, initiative, and cooperation. Yet each of these works raise a number of questions regarding the limits of interactivity: can an artwork still be considered interactive if no one participates, or if very few people participate? Should the success of the artwork be determined by the degree to which the participants get to know each other? By the degree to which the final outcome evolves from the work's beginning? Can an

interactive artwork still be considered successful if it still looks and feels like the artist's own work after a large number of people have interacted with it? How much control should the artist have over the process that shapes the interactive artwork? How much control should the artist have (or not have) over the outcome if the work is finite? Should the success of the artwork be determined by the degree to which the participants learn something about themselves? Should an interactive artwork require the viewer to use their entire body?

Both lists of questions are by no means exhaustive. It is my hope that not only do these questions generate more questions, but also that they prompt both art educators and their students to examine more critically their use and understanding of the digital technologies they take for granted.

Notes

(1) Determinism is a philosophical system that posits every physical event, including human cognition and action, is causally determined by an unbroken chain of past occurrences and therefore makes it possible for us to know future effects with certainty. Technological determinism claims that technology is an autonomous, "self-controlling, self-determining, self-generating, self-propelling, self-propelling, self-perpetuating and self-expanding force...out of human control, changing under its own momentum and 'blindly' shaping society" (Chandler, 1995a, p.1).

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