

SOCIAL STUDIES OF INFORMATION & TECHNOLOGY ANNOTATED BIBLIOGRAPHY

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Course syllabus: www.purselipsquarejaw.org/info_tech/

THEORETICAL TOPOGRAPHY

Lectures:

Lash, Scott. 2001. *Critique of Information*. London: Sage.

Lovink, Geert. 2002. *Dark Fiber: Tracking Critical Internet Culture*. Cambridge: MIT Press.

Manovich, Lev. 2002. *The Language of New Media*. Cambridge: MIT Press.

Shields, Rob. 2002. *The Virtual*. London: Routledge.

Urry, John. 2000. *Sociology Beyond Societies: Mobilities for the Twenty-First Century*. London: Routledge.

Assigned Readings:

Week 1

Bukatman, Scott. 2002. Terminal Resistance/Cyborg Acceptance. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.196-201. London: Phaidon.

This excerpt is from Bukatman's book *Terminal Identity: The Virtual Subject in Postmodern Science Fiction*, which investigates the representation of space and technology in science fiction writing. Here specifically addressing the Cyborg in popular culture, Bukatman describes the forceful, hard and therefore masculine face of technology in Cyborg imagery, and specifically how it resists notions of more fluid, or feminine, expressions of technology. In *Terminator 2*, Arnold Schwarzenegger donned hard body armour and Linda Hamilton cultivated a hard body to defeat the liquid metal Terminator sent to kill them. In *Aliens*, the dripping female alien was defeated by Sigourney Weaver's character only after she had encased herself in a hard, robotic shell. These and other examples are used to illustrate our ambivalence "as the represented body moves ever more emphatically toward a symbiosis with electronic technology, it becomes ever more emphatically armoured... [conjuring a] *defensive* drive toward a techno-human fusion."

First, I wanted to provide a theoretical stage for exploring the 'language' of new media through science fiction, movies, comics, and video games. Popular culture is familiar to students: in addition to more recent Hollywood films are examples from Asian action and sci-fi/fantasy genres, anime and manga, other comic book super heroes and villains, and a variety of video

games. These examples can be used to explore notions of representation vs. performance, including Manovich's ideas about synthetic realism, interfaces, and cinema as information and code, and Shields' discussions of the virtual. More specifically, Bukatman's article introduces questions of gender and power to discussions of technology, as well as the role of fiction and entertainment in the cultural performance and experience of technology.

Gibson, William. 2002. *Neuromancer*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.102-107. London: Phaidon.

This excerpt from *Neuromancer* begins with the line, "The matrix has its roots in primitive arcade games". A classic of cyberpunk literature, and the book responsible for coining the term cyberspace, *Neuromancer* described a world saturated with technology, aggression and addiction to virtual experiences or the "consensual hallucination" of cyberspace. The excerpt focusses on the actual experience of 'jacking into the matrix,' an experience which appears to combine aspects of what we now recognise as virtual reality technologies and how we access and use the Internet.

Most students for this course will have been small children when *Neuromancer* was written and reading this excerpt will, in part, serve to introduce a generation familiar primarily with the World Wide Web to the broader cultural history and mythology of cyberspace, virtual reality and the Internet.

Haraway, Donna. 2002. *A Cyborg Manifesto*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.108-115. London: Phaidon.

Haraway wrote her essay, *A Cyborg Manifesto*, almost twenty years ago and it continues to inform scholarship to this day. As part of her book *Simians, Cyborgs and Women: The Reinvention of Nature*, Haraway explored the liberating potential of the human-machine hybrid. She positioned the Cyborg as a way of overcoming traditional, and restrictive, binary ontologies such as male/female or heterosexual/homosexual. This would be accomplished, in part, because the Cyborg was seen to be "without innocence" and yet also somehow ahistorical, since the "Cyborg would not recognize the Garden of Eden; it is not made of mud and cannot dream of returning to dust." Haraway's primary arguments include that the following boundaries have been successfully breached by technology: human/animal, machine/organism, and the physical/non-physical. This particular excerpt focusses on the breakdown of traditional binary oppositions and the rise of the hybrid.

Haraway's essay was chosen not only to introduce students to ontological questions relating to cyberspace, including her notion of "the translation of the world into a problem of coding," but also to connect these questions to broader social and cultural concerns regarding gender and body politics and their relations to technology and information. These ideas also offer the opportunity to connect and explore Urry's discussions of the actual and virtual movement of bodies and objects in a global information society, and how that relates to experiences of local community and citizenship, as well as the status of social and cultural studies in a world based not only on hybridity, but increasingly on mobility. Haraway's work can also be repositioned according to Lash's discussions of "technological forms of life" and his critique of information as representation.

Virilio, Paul. 2002. *The Aesthetics of Disappearance*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.90-95. London: Phaidon.

The basic premise of *The Aesthetics of Disappearance* is that as technology develops, it becomes smaller, faster and harder to actually see – and that, in turn, effects how we dwell in our buildings, cities and environments. Virilio investigates how new technologies and information blur traditional boundaries, and specifically how speed of transmission and communication, as well as technologies for achieving speed, effect our experience of space and time. This excerpt focusses on the temporal dimensions of our technologically-mediated experiences, including the paradoxical nature of privileging immediacy and the instant, while simultaneously maintaining a sense of the infinite and of stability (the “illusion of inertia”). The excerpt also introduces notions of the fractal or ascalar (same at all scales) nature of cyberspace and digital technologies.

This reading was selected to allow students to further investigate our social and spatial experiences of information and technology, and specifically to introduce the notion of time to their theoretical toolkit. Virilio’s discussion also raises questions concerning the nature of history and our performances of myth and memory. It opens a path towards notions of cultural narratives and ideas surrounding technology and progress. More specifically, these ideas can be connected to Shields’ exploration of the virtual and Manovich’s discussion of temporality, cinematic and digital (playback) loops, and the role of linearity in narrative. Furthermore, both Lash and Urry discuss temporality and linearity from a broadly phenomenological perspective of actual lived time and the real-time of new technologies.

Week 2

Deleuze, Gilles & Felix Guattari. 2002. *A Thousand Plateaus: Capitalism and Schizophrenia*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.96-101. London: Phaidon.

A Thousand Plateaus is most often cited to help explain or describe the spatial aspects of cyberspace. This excerpt deals with the book’s core notion of the rhizome – or the new metaphor of the root in opposition to the classical metaphor of the tree. It focusses on the characteristics of the rhizome: heterogeneous connection (assemblages), multiplicity and the “principle of asignifying rupture: against the oversignifying breaks separating structures or cutting across a single structure.” The rhizome operates by variation and expansion to create discontinuity, disruption and multiplicity. The rhizome is made only of lines, an acentred system without relations between points and positions. And macro/micro distinctions become ones of quality rather than quantity. Rhizomes effectively flow, but smooth space sometimes reacts against striated space, resulting in de-territorialisation – a process always relative to rigid segmentarity and threatened by re-territorialisation. Lines of flight are absolute de-territorialisations.

Deleuze and Guattari’s essay was selected as a means for students to explore the ontological, as well as spatial and cultural, aspects of information and technology. This excerpt raises questions around performance, ambiguity, ambivalence, heterogeneity, collectivity and emergence.

Lash, Scott. 2001. “Technological Forms of Life,” *Critique of Information*, pp. xx-xx. London: Sage.

Lash argues that technological culture is both emergent and intimately experienced; intuition is closer to the body and the organic than is the intellect. “In technological forms of life we make

sense of the world through technological systems. As sense-makers, we operate less like cyborgs than interfaces. These interfaces of humans and machines are conjunctions of organic and technological systems.” What is particularly interesting is the introduction of interface as a ‘real body’ that negotiates space, moves in unpredictable ways and challenges notions of distance and proximity. Regarding the implications of not merging human and machine, Lash argues that without the transformation of nature or culture, we are moved to the space of transmission. And it is in this space that metonymic substitution of one for the other replaces representation.

This reading allows students to continue their exploration of hybridity and multiplicity, while introducing a critical phenomenology to their theoretical toolkit. Lash positions his phenomenology *against* transcendental ontology, and for “radical empiricism,” arguing that immanence is necessarily empirical and thereby recovering questions of embodiment and power in our experiences of virtuality. Lash’s essay can also be connected to Urry’s discussions of the local and the global, and Lovink’s discussions of the role of critical ‘Net cultures in real-world political resistance.

Shields, Rob. 2002. “Risk Culture, Trust and the Virtual,” Chapter 8, *The Virtual*, pp. 184-204. London: Routledge.

Shields’ essay further sets the stage for students to explore the political and embodied aspects of information and technology, as he argues “that the virtual plays a central role in assessments and decisions concerning risk in everyday life.” Beginning with the assertion that risk is as much virtual as it is actual, Shields explores the relationships between quantities and qualities of information and risk, and the role of mass media in the circulation of information. He describes how people are asked, or even forced, to make everyday decisions (from family-based decisions to higher profile policy assessments) based on the information they are given by experts (including technologists). As such, our spaces of (political, ethical) action may be described in terms of spaces and systems of knowledge: “Whereas risk was once dealt with in terms of *concrete* dangers and calculation of *probable* risks, the risk society thesis [i.e. Beck et al.] suggests that *abstract* notions of threat or even urban myths are also significant aspects of an overall sense of threat and crisis.”

This essay was chosen to make explicit the interconnectedness of the virtual and the actual, and to give students tools for evaluating the actual (including material) dimensions of invisible and seemingly intangible information flows associated with the virtual. Shields’ work can also be connected to Lovink’s discussions of network fears and desires, political economies, and the role of tactical media and digital resistance.

Stephenson, Neal. 2002. *Snow Crash*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.164-169. London: Phaidon.

Like Gibson’s *Neuromancer*, Stephenson’s *Snow Crash* is considered a classic of the cyberpunk genre. The story takes place in the “Metaverse,” a communal virtual space at core architectural and urban, although characterised by disorder, simulacra and the denial of three-dimensional space. Metaverse is most similar to current understandings of “augmented reality” or technologically and digitally “enhanced” spaces, albeit a city with disjunctures and anomalies. *Snow Crash* itself is a computer virus that engages the main character in both virtual and real space, and this excerpt connects the virus to real-world rituals and myths of possession in order to explain the ease of movement between virtual and actual life.

This piece of science fiction was selected as a means for students to further explore the connection between virtual and ‘real’ life, as well as introducing them to the historical practice of connecting

new technologies with old and familiar innovations in order to encourage use and ease the sense of risk. As such, Stephenson's writing can be connected to Shields' discussion of the virtual and risk, as well as to the cultural history it shares with Gibson's *Neuromancer* and the role of cyberpunk literature in our understandings of technology.

CODE

Lectures:

Abbate, Janet. 1999. *Inventing the Internet*. Cambridge: MIT Press.

Himanen, Pekka. 2001. *The Hacker Ethic and the Spirit of the New Economy*. New York: Random House.

Lessig, Lawrence. 1999. *Code and Other Laws of Cyberspace*. New York: Basic Books.

Lunenfeld, Peter. 2001. *Snap to Grid: A User's Guide to Digital Arts, Media, and Cultures*. Cambridge: MIT Press.

Assigned Readings:

Week 1

Forster, EM. 2002. *The Machine Stops*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.28-33. London: Phaidon.

Forster's *The Machine Stops* was written in 1909 and describes a world that has been profoundly impacted by technology, and where people have become isolated from each other in ways that were later expressed in terms of fears surrounding a dystopian cyberspace. This excerpt focusses on an exchange between a mother and son, the mother isolated in an underground home, connected to everything by technology, but unable to act without the technological intervention of the Machine. Her son is positioned as subversive because of his desire to visit the surface of the Earth and his questioning of the usefulness of the Machine, a force that he understands prevents his mother from wanting to join him in the 'real' world despite her acceptance of it as a positive and enabling presence in her life.

This reading was specifically chosen as a means of introducing students to our cultural and historical fascination with technology, our beliefs in progress and our paradoxical fears about being controlled by machines. This tension reappears regularly in social and cultural responses to new technologies and can be seen as connected to broader concerns surrounding the alienation of humanity and the perceived breakdown of traditional social institutions.

Licklider, JCR. 2002. Man-Computer Symbiosis. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.52-59. London: Phaidon.

Licklider is considered to have had an integral role in early understandings of human-computer interaction. Basically, Licklider understood that if tedious and time-consuming tasks could be completed more efficiently by computers, then people would have the freedom to do more exciting and important things. Licklider understood the ideal relationship between people and machines to be one of symbiosis, in which humanity would be improved by technological intervention. This improvement would be predicated on our ability to control the machine. Positioning humans and machines as fundamentally different, and each limited by its own functional parameters, Licklider sought to improve each by making them extensions of the other.

With this reading, students are introduced to early notions of cybernetics and its reliance on architectures of control. As explained in detail by Abbate's history of the Internet, Licklider was instrumental in the development of a system that would amplify the human mind. ARPA emerged as the institution which would support this technological research, and with the advent of packet-switching technologies, later create the Internet – itself modelled on these architectures of control. This type of control can be connected to Lessig's discussions of code, identification, authentication and regulation, and his claim that cyberspace is not, and never has been, a space of liberty.

McLuhan, Marshall. 2002. The Gadget-Lover: Narcissus as Narcosis. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.68-75. London: Phaidon.

McLuhan uses the myth of Narcissus to demonstrate how technological extensions induce a state of 'numbness' in the person, or subject. In this excerpt, McLuhan focusses on how Narcissus fell in love with anything that resembled his self, and suggests that if we seek to extend ourselves through technology we risk being always already in love with it, and subsequently incapable of critical engagement. This raises the possibility that in our desire to control machines, we effectively control ourselves in the process: "Thus the age of anxiety and of electric media is also the age of the unconscious and of apathy." As well, McLuhan claims that "with the arrival of electric technology, man extended, or set outside himself, a live model of the central nervous system itself. To the degree that this is so, it is a development that suggests a desperate and suicidal autoamputation ..." which, of course, is connected to this sense of numbness or narcosis.

McLuhan's article was selected so that students could begin to explore the implications of, and early concerns about, blurred boundaries between humans and machines, especially as they relate to our understandings of control and agency. McLuhan was one of the first to suggest the risks of new technologies, and his writing provides a stage from which students may further explore notions of code and control. The essay also provides an interesting counter-point to Himmanen's vaguely romantic account of the development of open-source software and the hacker love of code.

Week 2

Bolter, JD. 2002. Essays of Operation. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.40-45. London: Phaidon.

This excerpt is from Bolter's book, *Turing Man*, in which he investigates the history and implications of the Turing Machine and similar innovations like von Neumann processors. Turing's contributions to symbolic logic led him to propose similarities between human logic and mechanical procedures, which in turn led to what is now known as the Turing Test, used to determine if a computer program is intelligent. The excerpt defines Turing machines in terms of their states and symbols, or the 0/1 binary logic of computers, and their principles of operation or rule-sets. Theoretical Turing machines led to the von Neumann computer, named after the mathematician who built the first real Turing machine – or information processor - from vacuum tubes. Essentially, the von Neumann computer was a central processing unit, or CPU, which came to power all computers and enable multiple operations to take place according to multiple rule sets based on the familiar 0/1 binary state of data. This allowed for the creation of many types of software that could run on one machine, thereby creating a universal (i.e. not limited to one set of operations) Turing machine.

Bolter's essay was selected to provide students with a solid understanding of how computers work, and how all information technology continues to be based on binary operations established by people like Turing and von Neumann. This reading also continues an exploration of code and control, as well as allowing further exploration of associated assumptions about humanity and the limitations of code based on its binary nature.

Bush, Vannevar. 2002. As We May Think. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.34-39. London: Phaidon.

As We May Think was published in 1945, and is now considered to be the first description of what would become known as hypertext, or the non-linear storage and retrieval of information we associate with the Internet. Bush described what he called the Memex machine, which would augment human memory and allow us to process and share information in ways that were more compatible with how we already think and make connections between disparate pieces of knowledge. Memex users would be able to store information in the actual memex machine, essentially a technologically -enhanced desk, and create their own documents by keeping a record of the trail created as they read, and associated, other materials. In other words, the memex was a device for preserving associative memories in ways that could then be shared with, and continued by others. In this way, sideways trails become just as relevant as up-and-down hierarchies or linear narratives.

Bush's memex allows students to continue their exploration of early computing machines and the desire to both mimic and improve human intellect. The essay also provides students a chance to investigate the precursors to now familiar hypertext linking methods and their impact on our understandings of narrative and the order of information. Bush's vision, however, provides an interesting counter-point to notions of linear and logical control in the face of the limitations of binary expressions and operations.

Engelbart, Douglas. 2002. Augmenting Human Intellect: A Conceptual Framework. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.60-67. London: Phaidon.

Along with Licklider, Engelbart is credited with the early development of computing, and this article explains his vision for interactive hypermedia, including what would now be recognised as the mouse and windows-based screen interface. Engelbart's system was designed to act as a 'clerk' to help people with tasks involving large amounts of information; as the title suggests, Engelbart was interested in augmenting the human mind, in similar ways to those envisioned by people like Licklider, in order to aid in complex problem-solving. Explicitly advocating a functional systems approach to understanding technology and people, Engelbart's 'conceptual framework' was based on the interconnectedness of users, input and output devices. In this excerpt, the computing machine would serve the architect as a clerk would, but with the augmented capability of being able to process and display information in multiple ways more quickly, thereby allowing the architect to create and modify models more efficiently.

This reading allows students to continue their exploration and understanding of early computing technologies, the evolution of now-familiar computing metaphors and tools, and the historical binary, if complementary, relationships between humans and machines.

Wiener, Norbert. 2002. Organization of the Message. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.46-51. London: Phaidon.

Wiener is known as the father of cybernetics, or technological architectures of control based on Wiener's conviction that the world was best understood in terms of feedback loops. His basic position was that all animals are machines subject to learning and feedback; in other words, the computer was simply a more powerful (i.e. faster) version of the human mind and the distinction between humans and machines became irrelevant: humans were machines. The first-order cybernetics associated with Wiener's vision was heavily dependent on hardware that adequately mimicked the human body and mind; for example, vacuum tubes served as 'neurons' and servo mechanisms as 'nerves'. This excerpt focusses on Wiener's notion that what was important about organisms was not the material from which they were made, but the process by which they lived – and he sought to replicate these processes in computers. Drawing on biological descriptions of cell division and twins, Wiener argues that because genetic information, the very matter of life, can be "transmitted or modified and duplicated," so too can other patterns of information. More specifically, Wiener argued that information should be able to be transmitted, modified and duplicated according to natural patterns, just as are human beings.

Wiener's cybernetics had a tremendous impact on modern computing, and continues to inform the development of most information technologies and systems. With this reading, students are introduced to another foundational approach to understanding the relationship between humans and machines. Cybernetics perhaps best exemplifies the limits of binary code and architectures of control, and students may explore the ontological implications of human essence defined explicitly in informational terms. Furthermore, this raises questions about the social implications of using technology that was designed according to these assumptions about people.

INFORMATION WAR

Lectures:

Critical Art Ensemble. 2001. *Digital Resistance*. New York: Autonomedia.

Lessig, Lawrence. 2002. *The Future of Ideas: The Fate of the Commons in a Connected World*. New York: Vintage.

Ludlow, Peter (ed.). 2001. *Crypto Anarchy, Cyberstates, and Pirate Utopias*. Cambridge: MIT Press.

Norris, Pippa. 2001. *Digital Divide?: Civic Engagement, Information Poverty, and the Internet Worldwide*. Cambridge: Cambridge University Press.

Virilio, Paul. 2001. *Information Bomb*. New York: Verso.

Assigned Readings:

Week 1

De Landa, Manuel. 2002. Policing the Spectrum. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.144-149. London: Phaidon.

This excerpt is taken from De Landa's book *War in the Age of Intelligent Machines*, which provides a sort of history of weaponry from the perspective of computers, nonlinear emergent dynamics, chaos and complexity. De Landa also draws examples from the history of information technologies, explaining them according to Virilio's *Aesthetics of Disappearance* and Baudrillard's simulacra, as well as theories of artificial intelligence and life, and hacker culture. From computing in the military and business to the hands of obsessive tinkerers in the hacker community, in this excerpt De Landa traces the struggle between 'free' and proprietary information. De Landa outlines his concept of the 'machinic phylum' as guided by non-linear principles that encourage self-assembly – the process by which we may understand how it was hackers, and not the military or industry, who built in enough interactivity with the machine to effectively bring computers to the masses. The excerpt concludes with De Landa's caution that the same ethic created computer viruses and allows for new forms of organised crime and terrorism.

This article was selected as a possible path of student exploration regarding the historical basis of the free software movement, and the very nature of information as something one has, or does not have. Information war may be understood in terms of information, technology, social regulation and cultural conflict. De Landa's work can be related to Himmanen's discussions of the hacker ethic (covered in the code section of the class) and Lessig's descriptions of information technologies and the future of the commons, or democratic participation.

Moglen, Eben. 1999. Anarchism Triumphant: Free Software and the Death of Copyright. *First Monday* 4(8). Available online at http://www.firstmonday.dk/issues/issue4_8/moglen/.

According to the author, this article addresses the development and spread of the Linux operating system as a landmark example of the free software movement. Rather than being seen as marginal to the broader commercial software market, Linux is understood as evidence of a crucial first step in the erosion of the intellectual property system. Of particular interest is the description of the expressivity of code commenting narratives, as much of code is non-functional in terms of the program and is written specifically for other programmers. Seen to facilitate collaboration and collective authorship, the expressive qualities of code are seen in terms of social interaction and free-form innovation, where software evades definition as property. This performance is then situated within discussions of anarchism as a mode of production, where coder reputation is earned with the explicit acknowledgement that the 'real' work was done by everyone else.

This article was selected to allow students to further explore the history and culture of the free software movement, and its political and economic implications. Ownership of information is central to notions of information war, and Moglen offers Linux as an example of different sorts of power relations that emerge when code is not controlled or owned. This article is related to Himmanen's discussions of the hacker ethic, as well as to Lessig's discussions of intellectual property and copyright of information.

Ronfeldt, David and John Arquilla. 2001. Networks, Netwars, and the Fight for the Future. *First Monday* 6(10). Available online at http://www.firstmonday.dk/issues/issue6_10/ronfeldt/.

"Netwar is an emerging mode of conflict in which the protagonists - ranging from terrorist and criminal organizations on the dark side, to militant social activists on the bright side - use network forms of organization, doctrine, strategy, and technology attuned to the information age." This paper examines theories of netwar based on organisational network analyses, and argues that current patterns of global organised crime and terrorism can be understood in terms of non-hierarchical network relationships. The authors argue that the hierarchical structure of government and state are incompatible with network practices and, therefore, are ill-equipped for counter-attack in the event of netwar.

This paper continues to set the stage for student explorations of information, access to technology, power relations and conflict. Work by the Critical Art Ensemble and Lessig offer a more critical perspective on what may constitute netwar, and precisely what is at stake in information war. It may also be connected to Lovink's work discussed in the theoretical topography part of the course, and notions of resistance to, and through, technology.

Week 2

Birdsall, William F. 2000. The Digital Divide in the Liberal State: A Canadian Perspective. *First Monday* 5(12). Available online at http://www.firstmonday.dk/issues/issue5_12/birdsall/.

Addressing the notion of the digital divide, or information 'haves' and 'have-nots,' in Canada, Birdsall evaluates the impact of federal policy on the 'connectedness' of Canadians. The paper argues that national mandates to provide broadband Internet access to all Canadians are examples of a longer Canadian policy tradition of universalism. "As one of the largest countries in the world geographically with a widely dispersed, sparse population, communication technologies

have always played an important role in Canadian nation building and identity. Universal access to communications technologies is part of this tradition of universalism.” However, it is precisely this Canadian liberal public philosophy that Birdsall identifies as the primary barrier to the elimination of the digital divide in Canada. He argues that the ‘digital divide’ is constructed in Canada as an administrative issue, and is “shifted out of the political public policy arena into bureaucratic programs.” But recipients of these social programs are often stigmatised, or understood to be in a temporary state or set of conditions. The article sums up the digital divide in terms of the market: “the “have-nots” on the negative side of digital divide will be served by the limited resources of public agencies until such time as these individuals can move to the other side of the divide, that is to say, until such time as they re-enter the economic market.”

This reading was selected to introduce students to the power relations implicated in questions of access to information (when information is understood as capital in the broadest sense), as well as to Canadian policies regarding information technologies, citizenship and governance. It can also be situated in relation to Norris’ broader examination of ‘information poverty’ and civic engagement around the world. The article raises issues of information as power and sets the stage for a critical examination of information as commodity and access to technology and skills.

Rheingold, Howard. 2002. *The Power of the Mobile Many. Smart Mobs: The Power of the Mobile Many.* New York: Perseus.

While overly optimistic, Rheingold’s essay describes the democratic potential of mobile technologies, as crowds of people can instantly communicate and coordinate in swarm-like fashion, quickly and efficiently effecting political change. This particular chapter cites the recent ousting of President Estrada in the Philippines, aided in large part by the coordination by text-messaging of mass protests, and the quick transmission of subversive, or resistant, Filipino political and cultural knowledge. Similar stories are cited in relation to the 1999 WTO protests in Seattle, and both are described in terms of (guerrilla) “swarming tactics” and “netwars” or the transmission and use of information technologies to bring about political objectives. Accordingly, smart mobs may just as easily use the same tactics for non-democratic ends, and technology is positioned in terms of either democratic liberation or terrorism.

Rheingold’s book takes issues familiar from the early days of computer networks and applies them to emerging mobile technologies, ostensibly concerned with the possibilities for communal action. The excerpt introduces students to emerging social practices associated with mobile technologies, and opens a path towards the political implications of always-on communication. It can also be connected to more critical perspectives engaged in Ludlow’s edited volume, including notions of a sovereign or independent cyberspace, crypto-anarchy (or the ability to act anonymously), and the emergence of new structures of control. It may also be brought to bear on Lessig’s discussions of the digital commons, and discussions of access and the digital divide.

VIRTUAL BODIES

Lectures:

Critical Art Ensemble. 1997. *Flesh Machine: Cyborgs, Designer Babies & The New Eugenetic Consciousness.* New York: Autonomedia.

Critical Art Ensemble. 2002. *Molecular Invasion.* New York: Autonomedia.

Hayles, N. Katherine. 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: University of Chicago Press.

Lupton, Deborah. 2000. The Embodied Computer/User. In D. Bell and B. Kennedy (eds.) *The Cybercultures Reader*, pp. 477-487. London: Routledge.

Stone, Alluquere Rosanne. 2000. Will the Real Body Please Stand Up? Boundary Stories About Virtual Cultures. In D. Bell and B. Kennedy (eds.) *The Cybercultures Reader*, pp. 504-528. London: Routledge.

Wood, John (ed.). 1998. *Virtual Embodied: Practices/Presence/Technologies*. London: Routledge.

Assigned Readings:

Week 1

Egan, Greg. 2002. Permutation City. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.222-229. London: Phaidon.

Greg Egan's novel *Permutation City* considers the experiences of a disembodied mind, after human consciousness can be downloaded into a computer. Central to this ability are notions of Strong AI, based on the idea that certain algorithms or processes are performed in certain ways, regardless of what (or who) is performing them. This implies that the computer's capacity to imitate other machines (like typewriters) and people (like filing clerks), is the same capacity of the human brain, itself also a machinic process. This excerpt of Egan's story focusses on Paul and a copy of himself he created as an experiment in Strong AI, and explores differences and power relations between the actual and virtual versions of Paul, and the possibility of intentionally deleting one's informational self, or what might be described as data-suicide.

This science fiction story was selected as an exploration of simulacra, and because it raises the question of what exactly constitutes a physical body when there is simultaneously a virtual copy or version. It allows the continued critical exploration of cultural boundaries between human and machines, as well as shifting focus to include the mind/body dichotomy and notions of embodied hybridity. Articles by Lash and Urry (discussed in the theoretical section of the course) offer points of critique, and Hayles' provides the broader context for ideas around the technologised body.

Levy, Steven. 2002. The Strong Claim. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.170-177. London: Phaidon.

This excerpt of from Levy's book *Artificial Life*, which Spiller describes as based on the premise that "all biological life is simply the manipulation of information." In other words, we are always already data bodies. And so, theoretically, it is possible to create computers (which are adept at processing information) that can be said to be "alive". The Strong approach to artificial life seeks to develop computational objects that are also reflexive organisms. In this particular excerpt, Levy discusses the computer virus as an example of an artificial life that evolves, responds and reproduces. He tells the story of the first "scientifically monitored release of a predatory information organism 'in the wild': Cohen's computer virus written in the C programming language. The excerpt closes with a description of early reactions to the full systems penetration

of Cohen's virus, from disbelief to fear of what might happen of artificial life were to get out of control.

This article provides students with further variations on, and descriptions of, data bodies as the 'hearts' of our 'real' bodies, as well as continuing themes of code and information war.

Moravec, Hans. 2002. *The Senses Have No Future*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.280-283. London: Phaidon.

Moravec's extreme position is an extension of Wiener's cybernetics, and he argues that we will be able to download human consciousness in digitised form and put it in robots, or in cyberspace. He believes that this ability will be crucial if we are to compete with highly complex and evolved robots or other technological forms of life. This short excerpt begins with a description of the computational complexity of the human retina and brain, and the lesser capacity of current robotics. But Moravec claims that robotic intelligence will advance along the lines of processors, and human beings must find ways to adopt technology, or be rendered obsolete. Interestingly, Moravec adds that in order to stay competitive, "robots will have to grow in place, repeatedly restructuring the stuff of their bounded bodies into more refined and effective forms... As they arrange space, time and energy into forms best for computation, robots will... optimize computations." This optimisation will create an intellectual advantage over humans, and as geographical space is converted to cyberspace, the physical body will also cease to exist.

Moravec's vision for the future allows students to further examine how boundaries between mind and body are performed in relation to information and technology, and may be connected to Stone's discussions of 'real' bodies and identities.

Turkle, Sherry. *Constructions and Reconstructions of the Self in Virtual Reality*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.208-215. London: Phaidon.

Looking specifically at role playing in MUDs, Turkle argues that virtual worlds offer people the opportunity to explore identities that can later be abandoned or subsequently adopted in the 'real' world. Echoing now-familiar themes, she ends the essay with a call to "watch for a nascent culture of virtual reality that is paradoxically, a culture of the concrete... And watch for a culture that leaves a new amount of space for the idea that he or she who plays, argues and builds is a machine." This particular excerpt addresses the details of role playing games, and their status as liminal spaces; this status is only accentuated in cyberspace, as Turkle describes virtual realities as "role playing to a higher power." The excerpt focusses on the performative dimensions of identity in cyberspace, as exemplified by participation in MUDs. "MUDs are a context for constructions and reconstructions of identity; they are also a context for reflecting on old notions of identity itself."

Turkle's essay introduces the sociological concept of identity to discussions of information, minds, and bodies, and sets the stage for further explorations of gender and technology. This essay can be related to work by Hayles and Stone, as well as to earlier discussions of the Cyborg.

Week 2

Dery, Mark. 2002. Robocopulation: Sex Times Technology Equals the Future. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.274-279. London: Phaidon.

This excerpt is from Dery's book *Escape Velocity*, which according to Spiller, "explores a world that exists where the digital and the cultural collide." Part of this world comprises a "sensual and hedonistic undercurrent" that "sexes the machine." In this excerpt, Dery discusses 'teledildonics' or virtual sex; partners have no physical contact but are connected by digitally communicative and responsive suits, and, in cyberspace partners may not be who, or what, they seem. Dery explores the possible implications of virtual sex for identity, sexuality and sexual politics in the 'real' world. He discusses the simulated, or altered, reality possible in cybersex (the virtual as ideal) and offers Mike Saenz's extreme but oddly reasonable question: "When you're getting a virtual blow job, by a virtual Madonna ... did they take some sensor-clad dildo and fuck a goat? ... Whose data is this?"

This essay offers students another path by which to explore notions of simulacra, identity and technology. It may also be connected to Lupton's discussion of the embodied computer/user, and prior readings on gender and technology. It also opens up a space from which students may explore the dominance of pornography online and related sexual politics in the 'real' world of sexual bodies.

Franck, Karen. 2002. When I Enter Virtual Reality, What Body Will I Leave Behind?. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.238-245. London: Phaidon.

Franck's article examines broader issues surrounding the body and gender, and more specifically the types of 'bodies' we have and what happens to them when we enter virtual reality. Rather than completely losing our physical bodies, and becoming only data bodies, Franck argues that parts of our physical bodies cross over into the virtual. She writes "my experience of virtual reality depends upon my physical body's movement ... it is physical bodies that give us access to any world." But certain aspects of the physical body get left behind; the constraints and limitations of physical matter, as well as one's appearance. Franck discusses this in terms of liberation, especially for women and minorities: "the body I wish to leave behind is the one that I have learned to be, the one that follows the constraints and limitations society has taught me, as a woman, to adopt." The body in cyberspace is not seen to be masculine as much as gender-free, and virtual reality is expressed in terms of blurred boundaries, or spaces in-between, where gender and other social constructs are performed.

Further exposing students to feminist perspectives in cyberspace literature, Franck's paper continues discussions of the body and identity in virtual reality and how that might impact our physical bodies in the 'real' world, as well as our understandings of traditional dichotomies of male/female, body/mind and human/machine.

Kelly, Kevin. 2002. An Open Universe. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.216-221. London: Phaidon.

This excerpt is from Kelly's book *Out of Control*, which looks at the perils of what he calls the 'neo-biological' or proliferation of biological-technological hybrids: "In the coming neo-biological era, all we both rely on and fear will be born rather than made ... The river of life – at least its liquid logic – flows through it all." Central to Kelly's discussion are notions of self-organising, emergent behaviours. In this particular passage, he discusses nature's evolving 'parallel programs' and how these genetic models may be applied to principles of artificial life. Kelly describes artificial life in terms of assemblages, or syntheses instead of analyses; and Cyborgs may have emergent properties that do not appear in either parent. "Since life is a property of form, and not matter, the more materials we can transplant living behaviours into, the more examples of 'life-as-it-could-be' we can accumulate. This is an area that can only be studied by creating it, and Kelly cites mathematician Rudy Rucker who said that "Right now an ordinary computer program may be a thousand lines and take a few minutes to run. Artificial life is about finding a computer code that is only a few lines long and that takes a thousand years to run." As such, it is also about freedom or the ability to become something, or someone, else – to change.

Kelly's article was selected to introduce students to a model of the body as information that avoids earlier aesthetics of top-down control and focusses on notions of emergence and scale, rather than on space. The Critical Art Ensemble offers interesting potentials for critique and students can continue explorations that began with binary code and control.

Stelarc. 2002. Towards the Post-Human. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.262-269. London: Phaidon.

Returning to notions of hybridity and the flesh, performance artist Stelarc reconfigures boundaries between humans and machines, inside and outside, as well as challenging our understandings of the physical body and the stability of the flesh. He specifically interrogates the "sanctity and usefulness' of the body, especially in the face of cyberspace and other virtual realities. At the same time, Stelarc necessarily uses his own body (which he refers to as 'the' body) as a stage or canvas for expression, and he argues that the body should be colonised by technology and other interventions. In this excerpt, Stelarc discusses the invasion of technology, extended hybrid systems, phantom bodies and body-parts, high-fidelity illusions and fluid selves.

This essay was chosen to engage artistic critiques of information and technology, and to serve as another path from which to explore the performance of boundaries between mind and body, human and machine. The Critical Art Ensemble complements this work by further exploring the negotiation of these boundaries at the (invisible, internal) molecular level.

DIGITAL CITIES

Lectures:

Castells, Manuel. 2001. *The Castells Reader on Cities*. London: Blackwell.

Graham, Steven and Simon Marvin. 2001. *Splintering Urbanism*. London: Routledge.

Mitchell, William. 2000. *E-Topia*. Cambridge: MIT Press.

Sassen, Saskia (ed.). 2002. *Global Networks, Linked Cities*. London: Routledge.

Assigned Readings:

Week 1

Frazer, John. 2002. A Natural Model for Architecture/The Nature of the Evolutionary Body. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.246-255. London: Phaidon.

According to Spiller, Frazer's approach to architecture is "inspired by living and generative processes ... [and] it explores information ecologies and the dynamics of the spaces between objects." Influenced by Wiener's and Pask's cybernetics, Frazer's "dynamic" architectures draw on feedback loops, complexity, emergent behaviour and genetic algorithms; his buildings are open-ended and responsive. In this excerpt, Frazer describes his evolutionary architectural model as comprising "a genetic code script, rules for the development of the code, mapping of the code to a virtual model, the nature of the environment for the development of the model and, most importantly, the criteria for selection." This process-driven model draws on John Holland's accounts of adaptation in natural and artificial systems, and relies on generative descriptions, computer modeling and simulation, and iterative adaptation. Frazer also discusses his model in terms of the "extended architect," a variation on previously discussed notions of augmented intellect and goes so far as to suggest that his buildings may constitute artificial forms of life.

This article was selected so that students could further explore notions of emergence, and their connection to cybernetics; at the same time, students may continue critical engagement of the application of biological models to human (social and cultural) behaviour.

Novak, Marcos. 2002. Liquid Architectures in Cyberspace. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.150-157. London: Phaidon.

In 1991, Novak was one of the first to thoroughly explore the spatial and architectural corollaries of cyberspace and his work continues to impact discussions of space and culture. According to Spiller, Novak "argues that buildable and built architecture is only a portion of the architect's production. His premise is that, throughout history, there has been a tradition of deliberately unbuildable architectural projects. His notion of 'liquid architecture in cyberspace' is an electronic version of the space of the visionary but deliberately unbuildable project." Accordingly, Novak was interested in both architecture and cyberspace as spaces of transformation. This excerpt focusses on his discussion of cyberspace and liquid architecture: "cyberspace itself is architecture, but it also contains architecture, but now without constraint as to phenomenal size." Novak rejects the dualism of appearance and essence, and defines liquid architecture in living terms and as an emergent, open-ended system: "a work of liquid architecture is no longer a single edifice, but a continuum of edifices, smoothly or rhythmically evolving in both space and time ... [it] is clearly a dematerialized architecture ... no longer satisfied with only space and light and all the aspects of the real world. It is an architecture of fluctuating relations between abstract elements."

Novak's article was one of the earliest examinations of cyberspace to bring notions of fluidity, emergence and scale to broader questions of space and building, and students may continue to explore these connections. His work can also be connected to the theoretical topography with which students are familiar. It also continues to set the stage for an investigation of the impact of information and technology on our notions of the city.

Pask, Gordon. 2002. The Architectural Relevance of Cybernetics. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.76-83. London: Phaidon.

Pask was a well-known cyberneticist set apart by his understanding of the ability of users to influence the outcomes of cybernetic systems, which conflicted with prevailing 1960s views of artificial intelligence. At the heart of Pask's cybernetics are notions of information ecologies, or those broader and more complex contexts in which operations take place. Pask's position was that architecture is one of our primary conversational spaces, and should allow for the free flow of space and time, passivity and activity. Interested in notions of emergence and adaptability, Pask's ideas around cybernetics and architecture were predictive, rather than descriptive, and based on notions of "response" and "reflex." This excerpt specifically addresses evolutionary ideas in architecture, and cities as self-organising systems, insofar as architecture should be designed so that it responds to specific environments and human interactions. Also "let us apply [cybernetics] to the interaction between designer and the system he designs, rather than the interaction between the system and the people who inhabit it ... but notice the trick, the designer is controlling the construction of control systems and consequently design is control *of* control."

Pask's article provides students a continuing means to explore applications of cybernetics and systems-thinking to architectural spaces and human interaction.

Price, Cedric. 2002. Generator Project. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.84-89. London: Phaidon.

Price takes a critical approach to how technology is used to influence architecture; buildings are seen as enabling mechanisms that should only use "appropriate" technologies. Price designed (but never built) a "Fun Palace," now recognised as a forerunner to Paris' Pompidou Centre, and a building that could be created by users in real-time. The later Generator Project involved John Frazer, and took some of these ideas and created a plan for an 'intelligent' building, "a building that knew itself and even dreamt cybernetically." Afraid that users would not recognise the potential to change their architectural space, the Generator Project involved a program that would allow the Generator to register 'boredom' and suggest means of reorganisation. This excerpt focusses on the ways in which the Generator building would be able to adapt to users, to learn from previous events and interactions, and to adapt as would any living system. As Price describes, "architecture should have little to do with problem-solving – rather it should create desirable conditions and opportunities hitherto thought impossible."

The Generator Project gives students a concrete example of the application of cybernetics and evolutionary metaphors to architecture, and of the shapes that a living building might take.

Week 2

Mitchell, William. 2002. Soft Cites. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.230-237. London: Phaidon.

This excerpt is from Mitchell's book *City of Bits*, which investigates the impact of the Internet and e-commerce on our experience of urban structures and the city as spaces of surveillance and consumption; Mitchell's physical city also includes invisible architectures that are intimately connected to the virtual. In this excerpt, Mitchell explicitly connects virtual architectures to familiar physical architectures, and he describes what might constitute a virtual city of electronic transactions by conjuring the historical city and its physical transactions. Beginning with a description of historical public and, specifically, market places, Mitchell draws out electronic

transactions as happening in cyberspaces that are similar to markets, except that it is now bits, rather than goods, that are being exchanged. He also compares “hyperplans” or navigational structures in cyberspace as related to the street maps of physical cities, and encryption technologies to architectural enclosures or boundaries. Mitchell’s approach has a peculiar effect of ‘naturalising’ or ‘familiarising’ cyberspace, but not in the ways advocated by cyberneticists seeking to mimic the systems of nature.

Students may find many points of further exploration from Mitchell’s article, including the relationship between the virtual and the actual, as well as actual expectations of the virtual. This reading may also be connected to Lessig’s discussions of the digital commons.

Ostwald, Michael. 2000. *Virtual Urban Futures*. In D. Bell and B. Kennedy (eds.) *The Cybercultures Reader*, pp.658-675. London: Routledge.

Ostwald’s article focusses on the impact of information and technology in terms of changing spatial perceptions and the changing nature of urban space. He specifically draws out the physical and virtual status several architectural and social “institutions,” such as the agora and the mall, and a particular virtual space called Habitat. These explorations raise questions about public and private life, as well as with the everyday politics of consumption. Focussed directly on traditional matters of sociological concern, Ostwald describes the physical and virtual correlates of cyberspace.

This article was selected to help students reconnect practices in cybernetics and architecture to broader social and cultural concerns. Urry and Lash (familiar from the theoretical topography section of the course) are particularly helpful for furthering critical engagement with these issues, and both Lessig and Lovink (from the code and information war sections) can be used to expand these ideas into areas of information politics.

Rheingold, Howard. 2002. “The Era of Sentient Things” & “Wireless Quilts,” *Smart Mobs*. New York: Perseus.

This chapter of Rheingold’s popular book *Smart Mobs*, looks at the effect of wireless and mobile technologies on everyday life in the city. Networks of people and information moving through the urban environment are evaluated in terms of their impact at both the local, neighbourhood level and at the global level or post-colonial “third-space.” Rheingold also opens up discussion to include the regulation of wireless frequencies and the impact on privacy when all devices become location-aware and dependent.

These readings were selected because Rheingold is very good at describing emerging social and technological practices, but his work lacks a critical perspective or solid theoretical grounding. Students will be able to connect what Rheingold describes to earlier discussion on information technologies, the city and power in everyday life.

Spiller, Neil. 2002. *Vacillating Objects*. In N. Spiller (ed.) *Cyber_Reader: Critical Writings for the Digital Era*, pp.304-309. London: Phaidon.

Spiller’s work focusses on how virtual and actual spaces may be used to inform each other, and how each may be understood in terms of responsive environments. He argues that our “technologized digital world creates partial and split spaces [with] vacillating objects [that] can be in a variety of places at once.” The notion of vacillating objects is used to advance the objective of creating objects and spaces that change, rather than remaining static. As he writes, “an object will have many selves, many simultaneous forms. Technology is forcing the object to become a

subject, partial and anamorphic. The anamorphic object changes form when viewed from certain viewpoints, in different fields or in distorted mirrors. The new objects will have formal qualities that are determined by the virtual and physical terrain in which they are viewed or manipulated ... [and] the new vacillating objects take no notice of topological distinction.” But unlike some of the architecture influenced by cybernetics and other architectures of control, Spiller reminds us of the importance of uselessness, non-function and playfulness in architectural and social space. He concludes with a tour-de-force of alliteration: “new virtual, vital, viral and visceral spaces within which the new objects will operate will be infinite, variegated, variform, ventral, varicose, vitrified, vomiting, velutinous, venereal, versicoloured, ventripotentant, vascular and versatile...”

Spiller's article was selected to sum up the characteristics of digitally informed architectural spaces and objects, and allow student to tie this thinking back to the theoretical topography in which they began their explorations.