ABSTRACT

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CHAPTER ONE: INTRODUCTION

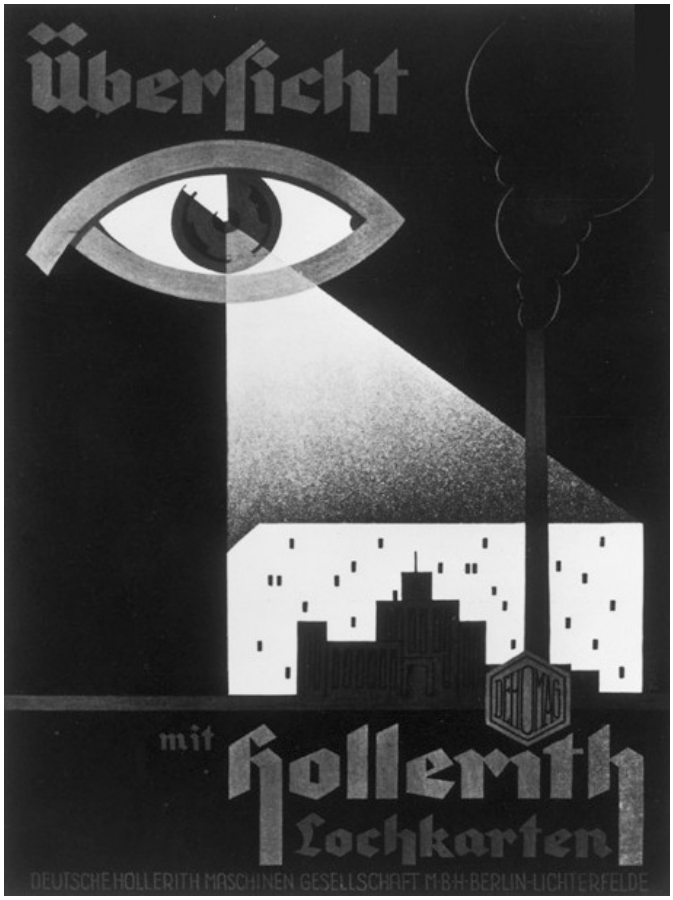

Figure 1: 1933 Dehomag advertisement, IBM and the Holocaust.

From Automated Genocide to the Dumbest Generation

Histories of computing technologies often feature images of early electronic machinery developed in America and Britain during World War II, and connect their emergence to heroic narratives of triumphant, democratic civilization over genocidal, totalitarian regimes.[1] By a seamless progression of innovation, commercialization, and dissemination, these forerunners laid the ground for subsequent eras of mainframe, mini, personal, and networked computers, on to state of the art mobile,

multimedia devices. However, in this dissertation that suggests, instead of another history, an approach *toward a philosophy of computing*, my inaugural image shall be a 1933 advertisement for Hollerith punch cards, the same one with which Edwin Black begins his 2001 book *IBM and the Holocaust: The Strategic Alliance Between Nazi Germany and America's Most Powerful Corporation*. Rays emanating from an all-seeing eye illuminate an enormous punch card, factory, and smokestack. The German text "Übersicht mit hollerith Lochkarten," whose i is dotted with the Dehomag logo, can be translated as "See everything with Hollerith punchcards" (Wikipedia 2014). Dehomag itself was an acronym for Deutsche Hollerith-Maschinen Gesellschaft mit beschränkter Haftung, the German subsidiary of the now ubiquitous American corporation International Business Machines that supplied equipment to the Nazis, including the tabulating machinery used to census populations, schedule railroads, and route their human cargo into the extermination facilities. Thus the image alludes to the commencement of a horrifying holocaust narrative to be told by Black, implicating IBM machinery, its employees, and its partners in America and Europe, with their bureaucratic counterparts in the murderous Nazi regime, like the infamous Adolf Eichmann, symbolizing by embodying the evil latent in apparently benign technological devices in a lifetime spent in their service. Others point out that Marshall McLuhan famously declared we humans to be their sex organs, developing alternate narratives to those associating technological progress with moral superiority of Anglo-American democracy. Instead, these punch card and sorting systems that preceded electronic systems were used for the automation of human destruction by the Nazis under guidance of IBM Germany, which lucrative business, Black argues with voluminous documentary evidence, the parent company in the United States tolerated if not encouraged with a blind eye to its purposes. IBM was gripped by its amoral corporate mantra and dazzled by its universe of technical possibilities; collective intelligence, punch drunk with newly discovered organizational possibilities of automated high speed tabulating, sorting, and printing machinery, materialized in the German populace as what philosopher Hannah Arendt called the

banality of evil, such that its individual agents like Eichmann would fail to admit any sense of wrongdoing.[2]

Examples of other uses of tabulating machinery by the Allies during World War II also credit IBM with enabling calculations by the USSBS, United States Strategic Bombing Survey, whose work has been credited for reaching the atomic bombing decision in 1945, by analyzing the effects of bombing in Germany, and in post-Nazi Europe a largely unchanged Dehomag utilized the same equipment to perform census operations by the occupying forces, once again on many of the same people, but for a different customer (Black 422-424).[3] IBM and American troops had quickly reappropriated Dehomag, using the rhetoric that its assets and employees belonged to an American enterprise, though it took years of bureaucratic thrashing to formally change its name to IBM Deutschland.[4] Black shows that the budding transnational corporation quickly reabsorbed its machines that had been used for running the German war effort, and employed them for purposes coextensive with the putatively benign, neutral *biopower* – to use the term with which Michel Foucault christened the new regime of governmental control – remaking postwar society. Through the 1950s and 1960s the company prospered, and sought to spread its influence through activities, conferences, and publications, as well as outright advertisements, all now ripe for study by media and popular culture historians, in addition to philosophers. Black notes that from that research IBM published but quickly withdrew a promotional book on the history of computing in Europe, which detailed the exploits of famous employees on both American and Nazi sides, the computer wizards of their day; a very rare book indeed, which Black claims is so rare as to not be found in any public library, or even Internet archives. "The men who headed up the IBM enterprise in Nazi Europe and America become revered giants within the corporation's global community. [Harrison] Chauncey became chairman of the IBM World Trade Corporation, and the European subsidiary managers were rewarded for the loyalty with top jobs. Their exploits during the Nazi era were lionized with amazing specificity in a promotional

book entitled *The History of Computing in Europe*, published in 1967 by IBM itself. However, an internal IBM review decided to immediately withdraw the book from the market" (425). Thus both a hidden history of the modern computing era and ripe store of unexamined philosophical perspectives awaits scholarly attention. My research devolves to the readily available material by early workers in the field, from Bush, Burks, Goldstein, von Neumann, Licklider, Kemeny, and so on, through Stallman, Knuth, Stroustrup, Gates, Torvalds, Jobs, and the like, yet this suppressed text symbolizes a holy grail of sorts.[5]

Black awakens us from this predigital nightmare perpetrated by the German and American government war machines, and more shockingly IBM employees in subsidiaries of this budding transnational, to renewed fears in the what he calls the Age of Realization, that more lists will be compiled against more people. Long before Black's research, in the final pages of the epilogue to his famous 1971 book *The Psychology of Computer Programming*, Gerald Weinberg takes on the role of philosopher, and warns of the latent threat of the banality of evil through the intentional use of programming and technical talent for malicious ends, though made in ironic, innocent ignorance of the real involvement of IBM in the holocaust.[6] "Because computers are such fascinating beasts, because programming is such a game, such a joy, we who program computers are in danger of becoming the unwitting pawns of those who would use our toys for not-so-playful ends. Can there be any doubt that if Hitler had computers at his command, one of the first application would have been keeping closer track of Jews and Gypsies so that all who should have gone to the ovens did go to the ovens?" (278). Is this a reflection of the need for a renewed critique and distancing ourselves from technology, or better treated as an invitation to consider it ever more thoroughly? Indeed, we might dare to cross Chauncey and European counterparts in that suppressed history with beloved heroes of the computer revolution, Internet entrepreneurs, and now millions of oblivious programmers, IT workers, and other technocrats who could be us today.

Though perhaps now killing innocents by dropping smart bombs from drones, rather extracting them from the populace via census forms, herding them into ghettos, and operating death camps, it remains important to think about how information is gathered and processed: whether by human programmers as steeped in evil as the vilest hacker, or morally ambivalent like Eichmann, or blind to the purposes of their efforts, or perhaps the lists are already being made by machines on their own, leading to future genocides portrayed in science fiction apocalypses like *The Terminator*. That is one extreme perspective epitomized in science fiction, excellently argued by N. Katherine Hayles and a host of digital humanities theorists. Weinberg goes on to argue that tyranny over liberty seems to be the default trajectory of the specific milieu in which our computer revolutions have occurred, in spite of the good intentions of those we salute as the architects of the information age (279). We all know, but seldom ponder, the potential outcomes, falling into the same trap as the mythical technological wizard Theuth of Plato's *Phaedrus*, unable to see all the good and evil potential of a small project when it is implemented en mass and, using an uncanny metaphor, takes on a life of its own.[7] However, I believe we are on a trajectory not aimed toward automated genocide, but rather unintentional stupefaction, reduction of potential in comparison to the increasing competence of machine cognition, despite enormous hopes and efforts by many well intentioned policy makers, engineers, and educators.

Soon after the second world war, J. C. R. Licklider promoted building computers to facilitate formulative thinking, a radical advance beyond their familiar use as super calculators supplanting rooms of human computers solving formulated problems, so that together in symbiosis, humans and machines can make decisions in complex situations. Like Theuth from the Platonic myth, he offers an explicit vision of technological prerequisites to achieve lofty social goals, such as time sharing, memory hardware, programming languages, and input output equipment well tracked by the ensuing history of computing scholarship.[8] Douglas Engelbart devoted his career to augmenting human intellect by developing hypermedia, word processing, teleconferencing, and innovative user interface tools

including the computer mouse pointer. He, too, championed enhancing individual and group cognitive efforts via computer technology, claiming that “the computer has many other capabilities for manipulating and displaying information that can be of significant benefit to the human in nonmathematical processes of planning, organizing, studying, etc. Every person who does his thinking with symbolized concepts (whether in the form of the English language, pictographs, formal logic, or mathematics) should be able to benefit significantly” (98). John Kemeny, inventor of the programming language BASIC, shared the optimism of Licklider and Engelbart that a great future of continuous improvement was in store for both humans and machines. "We are witnessing even now the evolution of a species in which the individual is subsumed under a group consciousness. Indeed it is a telepathic race. And I expect that computer networks will display all the marvelous traits that science fiction predicted for such strange beings" (71).[9]

Weinberg, who researched this period as a social psychologist, nonetheless concluded that tyranny over liberty seemed to be the default trajectory of the specific milieu in which our computer revolutions have occurred, in spite of the good intentions of those we salute as the architects of the information age (279). No wonder IBM yanked that book that would have deeply troubled Weinberg. How do we make sense of these contrary yet coextensive trajectories? By acknowledging that bad systems *have* developed and remain in use. Toward a philosophy of computing, the overall humanities research question briefly cast, *how have humans become dumber while machines continue to get smarter*, shall be approached conceptually as *post-postmodern network dividual cyborgs*, beings embodying the present condition in the United States, all of us – humans and our electronic devices – enacting network consumption, tightly coupled to the built environment, including increasingly intelligent machines, arrived at through decades of immersion in and constitution as expanding computer technologies in the overall context of late capitalist Internet age America, we who have, partly as a result, passed through a dumbest generation.[10] Part rhetorical cautionary tale that seems to

have occurred as a side effect of technological progress meant to prevent it, I wish to start here and develop historical and theoretical narratives to explain why the human-machine symbiote has reached its current evolutionary state that seems worse – instead of better – than Kemeny enthusiastically predicts, perhaps for not faithfully following the project he envisions. For he admitted that "the best-intentioned people, if they lack the technical expertise and the tools to achieve our goals, can make the situation worse instead of better. Therefore we must look to the coming of a new man-computer partnership to provide the means which, combined with sufficient concern by men for their fellowmen and for future generations, can hopefully bring about a new golden age for mankind." (145-146).

Another early critic of these enthusiastic projects of intelligence augmentation by tighter coupling of humans and computers, also a psychologist, is Joseph Weizenbaum, best known for his ELIZA program that simulated a Rogerian psychotherapist. His popular book published in 1976, *Computer Power and Human Reason: From Judgment to Calculation*, derides the early effects of the human-computer symbiosis gone bad, revealing the addictive characteristics of heavy computer use. "Wherever computer centers have become established, that is to say, in countless places in the United States, as well as in virtually all other industrial regions of the world, bright young men of disheveled appearance, often with sunken glowing eyes, can be seen sitting at computer consoles, their arms tensed and waiting to fire their fingers, already poised to strike, at the buttons and keys on which their attention seems to be as riveted as a gambler's on the rolling dice. . . . Their rumpled clothes, their unwashed and unshaven faces, and their uncombed hair all testify that they are oblivious to their bodies and to the world in which they move. They exist, at least when so engaged, only through and for the computers. These are computer bums, compulsive programmers" (116). But in emphasizing extreme cases of hard-core programmers, he draws our attention away from the mundane, long term effects of using particular technologies, just as writers who analyze geek cultures shift focus from what has happened among a small percentage of professionals to everyday America, a condition of general

stupefaction that Nietzsche referred to as the last man, that Horkheimer and Adorno decried as regressive bourgeois thinking (47).[11]

If a combination of deficiencies in technical training and good intentions characterized the past few decades, then the arrival of geeks on the cultural scene should raise less alarm than the hordes of mostly inept users that fills out with them the middle and lower classes. Such is the opinion of Langdon Winner, who seeks to dispel the rhetoric he calls *mythinformation*, "the almost religious conviction that a widespread adoption of computers and communications systems along with easy access to electronic information will automatically produce a better world for human living" ("Mythinformation" 592). To him, the computer revolution has been influenced by an *absent mind* rather than new wonders emerging from artificial intelligence research, while echoing the concern of philosophers and social scientists that democracy is not merely a matter of distributing information. The postmodern philosopher Frederic Jameson touches upon similar themes when he characterizes our comportment toward technology as a Promethean inferiority complex: we are as ashamed of our unknowing relationship to the culture we nevertheless created as we are towards technological artifacts (315). Yet another social and technology critic, Neil Postman, proposed the notion of *technopoly* in 1993 for the unnamed, multi-spectrum force that alters the structure of human interests down to the level of our symbols, affecting the interactions of communities and whole populations (20). Postman's position is reached by his taking an ecological view that is expansive, appreciative of the overall impact on cognition, combining mythinformation and the absent mind. It is from this vantage point that contemporary digital media theorist David Rushkoff argues, in *Program or Be Programmed: Ten Commands for a Digital Age*, that social hopes for the Internet seem to be failing, draining values and denying deep thinking rather than fostering highly articulated connections and new forms of creativity: "a society that looked at the Internet as a path toward highly articulated connections and new methods of creating meaning is instead finding itself disconnected, denied deep thinking, and drained of enduring values" (16). To compound the

damage on society as a whole, Jaron Lanier, another contemporary critic, argues in *Who Owns the Future?* that the Internet has spanned an ecosystem of what he calls *siren servers*, which allow a select few to monetize the network usage of the masses. "The clamor for online attention only turns into money for a token minority of ordinary people, but there is another new, tiny class of people who always benefit. Those who keep the new ledgers, the giant computing services that model you, spy on you, and predict your actions, turn you life activities into the greatest fortunes in history" (1-2).

It is from this critical perspective expressed by the thinkers just surveyed that I argue the decline in human intelligence, industriousness, and creativity – whose empirical validity is a research question but will be taken for granted here – will not consummate in a regression to prehuman forms, a digital dark age, or machine apocalypse, but rather *leave behind traces suggesting that more advantageous synergies with machine intelligence could have been achieved*. My thesis is that the problem is complicated by humans getting dumber for want of spending time programming, with working code, replaced by ordinary computer application use more akin to Marxian alienated labor in front of machinery control panels monitoring gauges, pushing buttons, and turning dials, than creative action. Thus the sinister Dehomag poster foreboding automated genocide gives way to imagery from the 2008 Disney movie *WALL-E*, of the evolutionary effects of generations lived in the machine-controlled spaceship environment of the *Axiom*. It depicts obese, shallowly content, physically and mentally unchallenged human consumers, whose needs are met and whose desires are fulfilled – precisely because they are also supplied and conditioned – by the surrounding intelligence of the built environment, their lives unfolding on screens aboard a gigantic cruise ship.[12]

Figure 2: Axiom passengers, WALL-E.

Philip Roth coined the term "the dumbest generation" in his 2000 novel *The Human Stain*, which Mark Bauerlein adopts for the title of his 2009 book *The Dumbest Generation: How the Digital Age Stupefies Young Americans and Jeopardizes Our Future*, which he applies to the majority segment of young Americans entering adulthood ignorant and little concerned with liberal arts learning and civic awareness.

My basic premise is that the dumbest generation has infected human being to steer it toward *WALL-E* torpor rather than apocalyptic science fiction narratives of automated destruction.[13] The compulsive programmer computer bums Weizenbaum decried have been replaced and quantitatively outnumbered by zombie horders of compulsive gamers, social networkers, and others enveloped in consumer practices, their time wasted in front of the screen.

It used to be time wasted in front of papers and books. Bauerlein asserts his study focuses on examining empirical research that when collected reveals declining intellectual conditions of young Americans, rather than critiquing their outward behavior or professed values. The research he cites appears to substantiate claims that most children in America spend more time with media than homework; studies conclude the leisure time hours kids spend with media equivalent to a full time job; and that leisure reading correlates directly on reading comprehension scores and academic progress. (4; 77; 50). Literary reader rates among 18-24-year-olds have dropped significantly for the last twenty

years, even with very low thresholds for what counts as literary reading. As Bauerlein expresses it, kids reject books like vegetables, unconcerned that aliteracy poses career obstacles (53). Yet busy adults yield to their children's demands for more television and online entertainment. Indeed, overall conduct has improved, producing the sense that the kids are all right. Moreover, Bauerlein asserts that many people believe that screen interactivity invites collaboration and activity, and is therefore superior to the solipsistic, passive reading practices of prior generations, appealing to the so-called Sesame Street effect that only fun learning is good (103-106). While interactive media improves more quickly than old-fashioned broadcast forms through short cycle positive feedback loops, there is no reciprocal effect improving individual minds, which stall as collective machine intelligence augments: “Digital enthusiasts witness faithfully the miraculous evolution of the digital sphere, but they also assume a parallel ascent by its consumers, an assumption with no evidence behind it. . . . The latest NAEP figures are but another entry in the ongoing catalog of knowledge and skill deficits among the Web's most dedicated partakers. . . . The Web grows, and the young adult mind stalls” (107-108). The American mind, which Harold Bloom declared was closing in 1987, has not opened; nor do vocabulary, memory, analytic talents, and erudition appear to expand through online experience. Put in grandiose terms, print literacy, the cornerstone of civilization, is being replaced with a dissimilar building block; imagination-inspiring books are supplanted by on-screen virtual realities. While Bauerlein does not develop the point that Postman takes to heart, his condemnation of online experience amounts to an ironic reiteration of the Platonic criticism of writing made in *Phaedrus* – ironic because the original claim was made against writing itself, when it was the popular new media usurping territory from oral traditions.[14]

For Bauerlein, it is time to analyze how worsening intellectual dispositions of Amercia's youth are strengthened by digital practices including gaming, blogging, and time spent manipulating devices. Nielsen research highlights what works, reminding us that the Web is now a consumer habitat, not an

educational one; with it, children develop habits that undermine classroom goals. Digital practices also disrupt informal physical settings where reading, discussions, and physical play took place for prior generations, stunting vocabulary growth. At the same time, the shared attention of parents, who are wrapped up in their devices, too, presents a new challenge for children. However, peer absorption for identity building is the greatest unmentioned vice of digital media. Limits of social life once managed by the family unit have been surpassed by communication technologies; the significance of the Web is nonstop peer contact rather than a universe of knowledge. As a consequence, the threshold into adulthood has changed because the rituals that used to introduce it are shunted by the digital realm. Attention extended to virtual social space is forming extensive, autonomous, generational cocoons, so that minds plateau at social joys of age 18, endangering civic health of the United States by ignoring cultural and civic inheritance. Nearly echoing Plato, Bauerlein exclaims “all the ingredients for making an informed and intelligent citizen are in place. . . . But it hasn't happened. . . . A different social life and a different mental life have formed among them. Technology has bred it, but the result doesn't tally with the fulsome descriptions of digital empowerment, global awareness, and virtual communities. Instead of opening young American minds to the stores of civilization and science and politics, technology has contracted their horizon to themselves, to the social scene around them” (10).

The threat posed by the dumbest generation relates to the connection between healthy, vigilant citizenry, and abundant knowledge. In Bauerlein's analysis, it is too late for them to catch up on knowledge and culture traits from a missed liberal education in their twenties, due to encroaching adult responsibilities. They will only become partial citizens. “As of 2008, the intellectual future of the United States looks dim. Not the economic future, or the technological, medical, or media future, but the future of civic understanding and liberal education. The social pressures and leisure preferences of young Americans, for all their silliness and brevity, help set the heading of the American mind, and the direction is downward" (233). This downward heading of the American mind towards *WALL-E*

characters shall be the net effect of social pressures and leisure preferences, exacerbated by digital media, for tradition-infused intellectual life cannot compete with screen-mediated social life, the latter killing culture. "The Dumbest Generation cares little for history books, civic principles, foreign affairs, comparative religions, and serious media and art, and it knows less. . . . The Dumbest Generation will cease being dumb only when it regards adolescence as an inferior realm of petty strivings and adulthood as a realm of civic, historical, and cultural awareness that puts them in touch with the perennial ideas and struggles" (234-235). Whereas Bauerlein ultimately blames custodians of culture at all levels, from policy makers to educators, treating the influx of screen technologies as an aggravating circumstance rather than root cause, I want to explore further how we got ourselves into this collective intelligence problem, that more advantageous synergies with machine intelligence could have been achieved, and that we humans are unfortunately getting dumber while machines continue to get smarter. From there I will propose the discipline critical programming as a means to alter that course.

A Collective Intelligence Problem

The term collective intelligence was coined by French cyberneticist Pierre Lévy, according to Henry Jenkins in the opening pages of his 2006 book *Convergence Culture: Where Old and New Media Collide*. Jenkins uses it to name the contemporary collective process involving humans collaborating along with inhuman information technologies, especially Internet resources, together consuming and creating knowledge – obligatory cyborgs, already posthuman as Hayles puts it – because "none of us can know everything; each of us knows something; and we can put the pieces together if we pool our resources and combine our skills" (4). The concept, on the one hand, seems essential for any knowledge to exist at all, implicating signs, symbols, and artifacts with biological entities, making all intelligence collective; that the nonhuman, technological component plays an active, participatory role, on the other hand, seems to be an emergent phenomenon. Hayles refers to the

nondeterministic, evolutionary development of technology systems as *technogenesis*, and is adamant that it is deeply intertwined with concurrent *synaptogenesis*, the lifetime, peri-generational – rather than long term, epochal – changes in the human brains that use them (*How We Think* 11). Technogenesis and synaptogenesis approach strange attractors, although critiques of technology stretch from antiquity and are readily detected in 1960s onward, revealed by histories of computing inspiring a genre of scholarly texts.[15] Stoked by the success of the Dartmouth implementation of BASIC programming as a core student competency, John Kemeny, who invented the language in the late 1960s along with Thomas Kurtz, envisioned symbiotic evolution as the hoped for trajectory of human and machine species, spelled out in the former's 1972 book *Man and the Computer*. He reiterates at the educational level the enthusiasm Herbert Simon held for anticipated overall social and economic improvements through the collaborative mixing of technological systems with human beings. For Simon predicted in *The Shape of Automation for Men and Management*, published in 1965, that rapid automation, under full employment with stable skill profiles, would make the workplace happier and more relaxed, with most people working in sales (45). As Kemeny explains, and forewarns of the need for its good management, "given the rate of human reproduction, a century is much too short a period for the usual forces of evolution and natural selection to bring about a significant change. Our best hope therefore lies in a new kind of evolutionary process which I have called symbiotic evolution. . . . the existence of computer-communication networks will enable human beings at widely separated locations to function as a team. The vast capabilities of computer memories will enable use to make effective use of the explosion of human information and knowledge. . . . However, this evolutionary development is only possible if man is willing to make drastic changes in his life style and in his conception of his own goals. . . . Since it is unlikely that any educational system can provide a training that will see us through a lifetime, we may have to devise a system in which learning continues throughout one's productive life" (144). His implicit argument is that through learning to program computers do perform the

formerly mundane, repetitive knowledge work of prior generations, masses of humans who knowledgeably use information technologies will prosper in a new golden age.

Such one-sided predictions of overall social benefits by technology evangelists recall the critique of writing in Plato; indeed, Postman reminds us that technologies often redefine important terms like “information,” “political debate,” “news,” “public opinion,” even “freedom” and “intelligence.” He explains that knowledge monopolies develop and quickly surround important technologies, such as with broadcast television monopolies, undermining a school system grounded on the printed word: “those who have control over the workings of a particular technology accumulate power and inevitably form a kind of conspiracy against those who have no access to the specialized knowledge made available by the technology” (9). Winner's critique of the conviction that widespread adoption of computers and communications systems will automatically produce a better world for human living, mythinformation, expresses the contemporary ideology that all aspects of life will likewise benefit from speedy digitized information processing, compounded by political assumptions of computer romantics mistaking the supply of information with the ability to leverage it. This is simply a false assumption that ordinary citizens equipped with microcomputers will be able to counter the influence of massive, computer-based organizations.[16] He notes Plato and later Veblen realized knowledge was not in itself power, and faults computer enthusiasts for believing that expanding democracy is just a matter of distributing information (“Mythinformaton” 594). Postman also concludes that computers, like television, afford little to the masses, make no substantive, positive transformation of their condition, but instead primarily intrude on their lives, making the majority losers and only a few winners. “But to what extent has computer technology been an advantage to the masses of people? To steelworkers, vegetable-store owners, teachers, garage mechanics, musicians, bricklayers, dentists, and most of the rest into whose lives the computer now intrudes? . . . In a word, almost nothing that they need happens to the losers. Which is why they are losers" (10-11). To

Weizenbaum, as critical as Postman but having spent much time studying computer programmers, the most fateful social change introduced by the tremendous multiplication of computer power was the habit of collective groups to forgo deliberate thought about substantive change whenever a problem could be addressed by a technological solution (31). As I see it, a collective intelligence problem has developed, in part, because we *do* correlate the quantity of readily available information with intelligence, power, democracy. Making matters worse are the commercial, entertainment functions of the digital life overtaking original research and educational agendas.

The criticism of technology Bauerlein supplies aligns with others criticizing digital tools and technologization, concluding that intellectual growth is being stunted by social demands heightened by technologies. The opportunity cost of digital diversions is that they that supplant prior limits to teen life like the voices of elders around them, conversations of which they were a part or experienced through reading in books. Like the transition from oral to literate culture, there is a displacement of old media and traditional literacy by new media communications technologies. E-literacy derives from valorization of digital practices moreso than bibliphobia, yet knowledge and skill levels have not increased. Bauerlein feels confident to have found sufficient empirical research confirming that there has been no overall improvement in any measures of intellectual achievement, for all the enhanced learning techniques they permit; there is an overall downward trend, toward increasing leisure activities and less time spent reading. Thus one paradox of the information age is idealization of knowledge and communications, accompanied by less reading and knowledge of traditional intellectual objects beyond artifacts of youth culture. I argue the latter are a consequence of a second paradox Bauerlein notes, of slipping knowledge skills in the abundance of resources.[17] An anti-intellectual outlook is a common, shame-free condition of American youth consumer culture enmeshed in juvenile matters, to which Bauerlein devotes many pages to document. “Most young Americans possess little of the knowledge that makes for an informed citizen, and too few of them master the skills needed to negotiate an

information-heavy, communication-based society and economy. Furthermore, they avoid the resources and media that might enlighten them and boost their talents. An anti-intellectual outlook prevails in their leisure lives, squashing the lessons of school, and instead of producing a knowledgeable and querulous young mind, the youth culture of American society yields an adolescent consumer enmeshed in juvenile matters and secluded from adult realities" (16). Sustained linear, hierarchical, sequential thinking is in decline along with close, book-length reading, and collective intelligence does not seem to notice, responding to other priorities. For example, the Nielsen Norman model of web users reveals little sustained linear, word for word reading habits, overall lack of concentration, and otherwise insufficient reading habits for the eighty percent majority. To improve, they need to develop more basic literacy and patience, not more computer literacy and screen time (143-144). Desire for the greatest amount of content for the least amount of work, exemplified by the intellectual style of Wikipedia prose, yielding uninspiring knowledge language that must compete with amusing social language, disrupts the critical process in conjunction with absence of exposure to adult conversation.[18]

In such terms Bauerlein decries the astonishing ignorance of young person on the street actively cut off from world affairs, encased in immediate realities, affirmed by standardized tests and other national surveys. The current generation flaunts aliteracy as valid peer behavior, purportedly knowing, but choosing not to read books, because it is counterproductive. Antagonism of books versus computers indicates a replacement rather than a complement, a zero-sum game for time and money of young people. Benefits of reading books include providing places for reflection, finding role models, expressions of feelings, and moral convictions, sensing plot, character, argument structure, and aesthetic styles. Evidence of problems of poor reading and writing skills is found in need for remedial courses by college freshmen, and in noted deficiencies of workplace entrants.[19] Beyond these familiar complaints are threats to deeper rooted civic knowledge that is wound up in knowledge of events. Such lack of experience in cultural knowledge is the unnoticed complement of the contemporary science,

technology, engineering, math (STEM) deficit. Together they endanger the future of American society: “the current domestic and geopolitical situation demands that we generate not only more engineers, biochemists, nanophysicists, and entrepreneurs, but also men and women experienced in the ways of culture, prepared for contest in the marketplace of ideas. Knowledge-workers, wordsmiths, policy wonks . . . they don't emerge from nowhere. They need a long foreground of reading and writing, a home and school environment open to their development, a pipeline ahead and behind them” (203). We maintain shared belief in the value of broad, liberal education because lay support is needed for liberal arts to flourish; this is part of democratic faith, and ignoring society-ennobling traditions makes ignorant citizens, highlighting the negative effects of leisure trends of the general population (232-233). Bauerlein extends the national implications of the dumbest generation to include young adults under thirty unprepared to be culture warriors like Thomas Jefferson and other heroes of print culture, for full, not just partial, civic life. Essential cultivation of oral, mother tongue, natural language crucial for educational success is being harmed by digital practices. However, children's bedrooms have become multimedia centers leading to more individualized, unmonitored use. What is happening in the private zone verbal media of family and peer groups should be appraised along with what is happening in schools and with teachers. “Adolescent urgings, a teen world cranked up by technology, a knowledge world cranked down by abdicating mentors . . . they commingle and produce young Americans whose wits are just as keen as ever, but who waste them on screen diversions; kids whose ambitions may even exceed their forebears', but whose aims merge on career and consumer goals, not higher learning; youths who experience a typical stage of alienation from the adult world, but whose alienation doesn't stem from countercultural ideas and radical mentors (Karl Marx, Herbert Marcuse, Michel Foucault, etc.), but from an enveloping immersion in peer stuff" (201). The ingredients are in place for producing masses of *WALL-E* humans from the dumbest generation.

Societies of Control

As if on cue, it is to those radical mentors who formerly drew youth into that stage of healthy, countercultural alienation that Bauerlein attributes to cultivating civic understanding, that I turn next to continue laying out what I am calling a collective intelligence problem. At its heart are the cumulative effects of disciplinarity, interpellation, and production – precisely, Foucauldian biopower. In *Code/Space: Software and Everyday Life*, Rob Kitchin and Martin Dodge emphasize the positive, productive role of digital technologies, for "they make societies safer, healthier, and richer overall even as they do the work to regulate societies. . . . In Althusser's (1971) terms, software-driven technologies induce a process of interpellation, wherein people willingly and voluntarily subscribe to and desire their logic, trading potential disciplinary effects against benefits gained" (11). Yet Lawrence Lessig contends in *Free Culture* that legal rights to control cultural development are now more concentrated than ever; "never in our history have fewer had a legal right to control more of the development of our culture than now. . . . Law plus technology plus the market now interact to turn this historically benign regulation into the most significant regulation of culture that our free society has known" (170). Indeed, other cultural theorists agree that centralization, standards, and hierarchies are at heart of networks and digital media. David Rushkoff echoes Lessig: "instead of granting power to small businesses on the periphery, the net ends up granting even more authority to the central authorities, indexers, aggregators, and currencies through which all activity must pass. Without the search engine, we are lost. Without centrally directed domain name servers, the search engines are lost. Further, since digital content itself needs to be coded and decoded, it requires tremendous standardization from the outset. Far from liberating people and their ideas from hierarchies, the digital realm enforces central control on an entirely new level" (77). What is our position today if we are so much further removed from understanding how computer technologies work than when Weizenbaum wrote that, "if today's

programmers are largely unaware of the detailed structures of the physical machines they are using, of their languages, and of the translators that manipulate their programs, then they must also be largely ignorant of many of the arguments I have made here, particularly of those arguments concerning the universality of computers and the nature of effective procedures. How then do these programmers come to sense the power of the computer?" (103). We simply believe in their universal power because they do many things, ceaselessly and unerringly. Weizenbaum recounts the amusing observation by Studs Terkel that common people believe power is exercised by leaders, yet the American Secretary of State believes events befall us, and the Chief of Staff believes himself a slave to computers (259).[20]

Gilles Deleuze puts it beautifully in stating that computers are emblematic of *societies of control*, which operate by continuous and short-term manipulation, in contrast to discontinuous, long duration actions of the disciplinary societies that Foucault studied. “The operation of markets is now the instrument of social control and forms the impudent breed of our masters. Control is short-term and of rapid rates of turnover, but also continuous and without limit, while discipline was of long duration, infinite and discontinuous. Man is no longer man enclosed, but man in debt" (“Postscript” 6). Indebtedness to maintenance of the environment and socius replaces enclosure of humans as animals, implying discontinuous applications of control operations. Humans wander within confines now constituted by code space in addition to traditional forms. Control resembles a law of nature it is so imbricated in biopower and technological systems (Galloway 147). Winner identified three areas of concern for societies of control: pervasive surveillance, dissolution of face-to-face social bonds, and the integrity of social forms therefore being dependent on spatial and temporal limits built into human embodiment, but distorted by intelligent networks (“Mythinformation 596). Paul N. Edwards coins the term *closed-world discourse* “to describe the language, technologies, and practices that together supported the visions of centrally controlled, automated global power at the heart of American Cold War politics. Computers helped create and sustain this discourse in two ways. First, they allowed the

practical construction of central real-time military control systems on a gigantic scale. Second, they facilitated the metaphorical understanding of world politics as a sort of system subject to technological management” (7). As he develops in his book by the same name, cyborg imagery took its particular trajectory under closed-world discourse through the creation of iconographies and political subject positions that persisted through the 1980s in the United States. This inflection of the human-computer symbiosis “is the discourse of human automata: of cybernetic organisms for whom the human/machine boundary has been erased. Closed-world discourse represents the form of politics for such beings: a politics of the theorization and control of systems" (27).

The ultimate consequence of societies of control is that, considered from the machine side of reality, human souls are encased in network phenomena. Media theorist and philosopher of computing Friedrich Kittler argues in the preface to *Gramophone, Film, Typewriter*, that “understanding media despite McLuhan's title remains an impossibility precisely because the dominant information technologies of the day control all understanding and its illusion. . . . What counts are not the messages or the content with which they equip so-called souls for the duration of a technological era, but rather (and in strict accordance with McLuhan) their circuits, the very schematism of perceptibility" (xl-xli). In another wry quip, Kittler asserts that the ultimate meanings of data transmissions are not their content delivered to humans, but rather their metrics of efficiency, error rates, and latency. Extending Kittler's analysis, Nicholas Gane, in “Computerized Capitalism: The Media Theory of Jean-Francois Lyotard,” proposes that “knowledge, then, has not only become a commodity, but strangely structures the basis of commodity production itself, to the extent that it has become 'the principle force of production over the last few decades' (Lyotard 1984: 5). . . . For, to politicize McLuhan's famous dictum, the medium of commodity exchange becomes more important than the content of what is being exchanged” (434-435). Despite the hyperbole of McLuhan's statement that humans are the sex organs of machines, we need to remember how our cyborg subjectivity is situated within the built environment

that seeks to optimize itself in terms of performativity. The circuits represent the materialization of software as thing, hardened programming, and memory hardened into storage. Software theorist Wendy Chun provides philosophical reflection about the *dream of programmability* as return to the world of Laplaceian determinism, the consummation of Edwards' closed world, the Dehomag image under which humans are encouraged to allow themselves to be overwhelmed by machines for the benefit of their aspirations, even if they were to systematically exterminate thousands of their fellows. “New media empowers individuals by informing them of the future, making new media the future. . . . This future—as something that can be bought and sold—is linked intimately to the past, to computers as capable of being the future because, based on past data, they shape and predict it” (*Programmed Visions* 8-9).

Kittler founds his curious psychoanalytic method of the technological unconscious deployed in *Gramophone, Film, Typewriter* on the premise that “even secret files suffer a loss of power when real streams of data, bypassing writing and writers, turn out merely to be unreadable series of numbers circulating between networked computers. Technologies that not only subvert writing, but engulf it and carry it off along with so-called Man, render their own description impossible. Increasingly, data flows once confined to books and later to records and files are disappearing into black holes and boxes that, as artificial intelligence, are bidding us farewell on their way to nameless high commands “(xxxix-xl). Not only do programmed visions help form the closed world feedback loops that, in Bauerlein's update to Edwards' vision, weave cocoons around adolescent minds so they never escape the horizons of their peer struggles, but they suggest that alien temporalities of computer writing and reading, compared to the analogous human operations, feed the further conclusion that machines using software have gone off on their own hidden commands to do their own bidding, entrained by their own traces, that is, programming language data structures as graphemes (Kramer 103). We do not know what our writing does, especially now that it mixes into autonomous machine behavior. Kittler writes in his essay “There

is No Software," that "programming languages have eroded the monopoly of ordinary languages and grown into a new hierarchy of their own. This postmodern Tower of Babel reaches from simple operation codes whose linguistic extension is still a hardware configuration, passing through an assembler whose extension is the very opcode, up to high-level programming languages whose extension is that very assembler. In consequence, far-reaching chains of self-similarities in the sense defined by fractal theory organize the software as well as the hardware of every writing. What remains a problem is only recognizing these layers which, like modern media technologies in general, have been explicitly contrived to evade perception" (148). How can we know what our writing does to us if we cannot follow it, lying incredibly fast and small in circuits in place of paper? As the translator of *Gramophone, Film, Typewriter* notes, "of the many learned clichés circulating in the widening gyre of media studies, the most persistent may be the assurance that all the nasty things we can say about computers were already spelled out in Plato's critique of writing in *Phaedrus*" (xiii). What is user-friendly may not be designed in the best interests of users; easy to use may have purposes still baffling, potentially promoting unethical uses of technology (Johnson *User Centered Technology* 28). Users build metaphors for operational guesses at underlying structure, learning to interact by recovering from errors: this becomes a primary comportment of humans to machines, in stark contrast to the vision of Kemeny (Heim *Electric Language* 131). It may be, as Ruskkoff argues, that there is enough disinterest among users for technology leaders to maintain their monopolies, perhaps because the insignificant people spend so much of their psychic energy manipulating user interfaces. The conclusion to be drawn on this front, in parallel to Bauerlein, is that the masses are one full dimensional leap behind those in power, releasing collective agency to machines along with elite human groups, for they are also not the ones who design what those in power manipulate effortlessly to their advantage. They are more like addicts, lucky they know how to operate them. "Before, failing meant surrendering our agency to a new elite. In a digital age, failure could mean relinquishing our nascent collective agency to the machines

themselves" (20). This is the danger foreshadowed, in different ways, by movies from *Fail Safe* to *WALL-E*, of societies of control, not heralding an apocalyptic future but a new form of indenture to the very tools that are supposed to serve us.

The Quintessential Postmodern Object

Bauerlein shifts the blame from technology addiction to lax adults, who are blind or unconscionably unresponsive to what is happening with their children, and who are obliged to speak out to reverse these moral poles. He initially provides arguments for why digital technologies contribute to making the dumbest generation, but shifts to criticize the behavior and putative agenda of elite and everyday cultural custodians. I propose we continue going down the route of investigating and philosophizing technologies and human nature. One of the foils of ambition is taught helplessness, which processes are evident in mathematics curriculum and also with using technologies (Norman 43). At the other extreme from taught helplessness, anticipating a term elucidated by Ian Bogost, is *taught procedural literacy*, as Kemeny argues that learning through teaching the computer exemplifies symbiotic transformation. "The students learn an enormous amount by being forced to teach the computer how to solve a given problem. . . . The student must concentrate on the basic principles; he must understand the algorithm thoroughly in order to be able to explain it to a computer. On the other hand, he does not have to do any of the arithmetic or algebra. At Dartmouth we have seen hundreds of examples of spectacular success of learning through teaching the computer" (79). It is, of course, necessary to keep the momentum going so that programming skill becomes habitual, like handwriting, cooking, and general home economics. A danger lurks in the premise made by Kemeny that "the use of computers has been made so simple that acquiring programming skill is no harder than learning how to use a large library" (42-43). Instead, the deep thinker following how software works in order to use it is replaced by the manipulation of complex user interfaces distributed among countless other software

systems. That we are collectively not bothered that programming skill may devolve from its anticipated height in the 1980s to mere use competency is in evidence in the current absence of widespread programming instruction. Indeed, Rushkoff, as a contemporary update to Kemeny, finds that public schools primarily teach computer use, not programming. “Instead of teaching programming, most schools with computer literacy curricula teach programs. Kids learn how to use popular spreadsheet, word processing, and browsing software so that they can operate effectively in the high-tech workplace. . . . Their bigger problem is that their entire orientation to computing will be from the perspective of users. . . . Success means learning how to behave in the way the program needs her to" (135-136). This user orientation defining success as behaving in conformance with programmed visions makes our programmed visions all the more striated, to use Deleuze and Guattari's term, following the predefined grooves and tracks that the user interfaces offer.

There are many theories as to why programming literacy took this turn in the United States. While the narrative I will articulate includes the aforementioned components leading up to the dumbest generation – the absent mind, mythinformation, closed world discourse, programmed visions – a subtle yet pervasive influence seems rooted in the different ways that people learn. This insight comes from the emphasis Lev Manovich places on Alan Kay's vision for the democratization of software development, with its roots in the latter's interpretation of Jerome Bruner's learning theories, themselves influenced by the work of Jean Piaget. Kay, like Kemeny and Engelbart, envisioned radical transformation of human intelligence through its collaborative, symbiotic interaction with computing machinery. He proposed a universal media machine, the Dynabook, for manipulating personal dynamic media, that, in a more real sense than Kemeny's teaching the computer to think by programming it, created a dialog between human and machine via its magical paper. From his 2013 book *Software Takes Command*, Manovich writes, “Bruner gave slightly different names to these different mentalities [of Piaget]: enactive, iconic, and symbolic. While each mentality has developed at different stages of

human evolution, they continue to co-exist in an adult. . . . Kay's interpretation of this theory was that a user interface should appeal to all these three mentalities. In contrast to a command-line interface, which is not accessible for children and forces the adult to use only symbolic mentality, the new interface should also make use of emotive and iconic mentalities. . . . Mouse activates enactive mentality (know where you are, manipulate). Icons and windows activate iconic mentality (recognize, compare, configure.) Finally, Smalltalk programming language allows for the use of symbolic mentality (tie together long chains of reasoning, abstract.)" (97-98). I see this as a crucial development. *Theorizing learning as having enactive, iconic and symbolic components means that removing the obligatory need to program from a command-line interface – the symbolic – may have unintentionally weakened human intelligence*.[21] Kemeny mistook this redistribution of learning modes as the simplification of the interface, with the unintentional consequence that procedural rhetoric is no longer learned in the process of using computers, which he articulated in his criticism of computer-aided instruction. He sensed this danger in the mere use of computers for aiding instruction by automating delivery of content and evaluation. "Most students leave Dartmouth with a thorough understanding of the nature of modern computers and with a good idea as to how they may be used in later life. Since in CAI the student plays a rather passive role, somewhat like learning a language from a phonograph record, none of these benefits accrue" (80).

In a recent piece by Brendan I. Koerner recommending the programming language Ruby on Rails, he discusses how "J. Paul Gibson began to teach programming classes for teens out of frustration. A computer scientist at the National University of Ireland, he had by 1998 become shocked at the ineptness of his students" (29-30). There are numerous accounts of false hopes surrounding the potential of widespread adoption of computer programming curricula for American youth, as well as its infiltration into everyday skill sets of Postman's "steelworkers, vegetable-store owners, teachers, garage mechanics, musicians, bricklayers, dentists" (11). For the youngest children, Seymour Papert

developed and promoted the LOGO programming language, accompanied by various environments by which software programs controlled a mechanical turtle-like device that could be moved around a horizontal plane, or a virtual turtle-like icon moving on a computer display. Papert took aim at CAI for programming children, rather than the other way around. In *Mindstorms: Children, Computers, and Powerful Ideas*, a decade after Kemeny, he wrote, "in many schools today, the phrase computer-aided instruction means making the computer teach the child. One might say the computer is being used to program the child. In my vision, the child programs the computer and, in doing so, both acquires a sense of mastery over a piece of the most modern and powerful technology and establishes an intimate contact with some of the deepest ideas from science, from mathematics, and from the art of intellectual model building" (5). Looking back on it today, Koerner attributes the failure of LOGO to the methods by which it was taught, for Papert recommended hands-off, experimental, playful engagement, shunning formal classroom instruction. Koerner, on the contrary, claims that “many instructors simply plopped students in front of computers for one hour a week and hoped for the best” (30). Scholarship on teaching and learning programming reveals early exuberance and powerful claims, followed by disappointing empirical results, to a transition to its treatment as regular academic subject (Mayer 2). Even the brute force deployment of information technology hides false hopes. Koerner suggests that computers in school transformed from exploratory tools to become library aids, and children are taught nebulous set of computer skills rather than programming: “The resulting disillusionment coincided with the emergence of media that transformed school computers from exploratory tools into library aids. . . . Programming vanished from elementary schools for decades, even as computer science became an ever more popular pursuit at the collegiate level. A cultural consensus seemed to spring up: Kids should be taught a nebulous set of computer skills, but programing well, that was for grown-ups” (30). Ironically, the vision by Kay of a tool for children of all ages has become an onerous device that adults of all ages are conditioned to operate, shorn of the exploratory excitement of free-form, dialogic interaction.

The history of personal computers is replete with narratives of how command-line, symbolic interfaces were superseded by graphical environments, from GUI desktops to touch sensitive interfaces. A likely pattern develops when it comes to philosophical – dare I say ethical – contemplation of, as David Brin puts it, “why Johnny can't code.” Everyday computers no longer come ready to learn programming, and the consequences are ominous, as Brin exclaims. “Quietly and without fanfare, or even any comment or notice by software pundits, we have drifted into a situation where almost none of the millions of personal computers in America offers a line-programming language simple enough for kids to pick up fast. . . . In effect, we have allowed a situation to develop that is like a civilization devouring its seed corn” (“Why Johnny Can't Code” np). He argues that this undesirable, self inflicted global condition is akin to a tragedy of the commons, in this case the inability to reproduce the technology workforce using the very products produced by the current means of production. We could all fall into new dark ages if the global supply of capable technologists diminishes beyond a critical threshold, or the machines take over as dramatized in many science fictions. That is a limit case of which the dumbest generation represents the more likely outcome for the majority of humans, the masses. David Rushkoff nonetheless insists that civilization on an important threshold. "In the emerging, highly programmed landscape ahead, you will either create the software or you will be the software. It's really that simple: Program, or be programmed. Choose the former, and you gain access to the control panel of civilization. Choose the latter, and it could be the last real choice you get to make" (13-14). There are diminishing chances of having a choice in digital matters by relegating programming to others. As Ron Burnett expresses it in *How Images Think*, the majority of humans face software from position of profound ignorance: “the opaqueness of coding and the skills needed to create software are out of reach for the vast majority of people. Imagine a situation of illiteracy with respect to language that is so widespread most people would not even have a rudimentary understanding of the grammar of their mother tongue. This is the reality most individuals face with

software” (99).

Is it only historical accident, as Manovich suggests, that the Macintosh did not ship with a user development environment, corrupting Kay's vision? As he correctly notes, “only more recently, as the general computer literacy has widened and many new high-level programming languages have become available – Perl, PHP, Python, JavaScript, etc. – have more people started to create their own tools by writing software. A good example of a contemporary programming environment, very popular among artists and designers and which, in my view, is close to Kay's vision, is Processing" (105). Without an accessible programming environment, there can be no play like Papert wished for LOGO, and Brin implies the early personal computers provided. The unapproachability of computers at this level is partially due to their opaqueness, illiteracy of humans to their circuits, knowable only through use, despite the fact that their architecture is forty years old (Burnett 128). Clearly, access to programming takes a different form today; there is no READY prompt, as Montfort et. al. declare in their recent work from 2013 on critical code and platform studies, whose title is the famous one-liner program for the Commodore 64, *10 PRINT CHR$(205.5*RND(1)); : GOTO 10*. “But the widespread access to programming that was provided by early microcomputers does not exist in the same form today as it did in the 1970s and 1980s. When people turn on today's computers, they do not see a READY prompt that allows the user to immediately enter a BASIC program” (264). Indeed, Sherry Turkle famously states in *Life on the Screen* that the Apple Macintosh is the quintessential postmodern object, and recasts the relationship between human and machine as conversational rather than dictatorial. “Unlike the personal computers that had come before, the Mac encouraged users to stay at a surface level of visual representation and gave no hint of inner mechanisms. . . . The tools of the modernist culture of calculation became layered underneath the experience of the culture of simulation. . . . These developments all pointed to a new kind of experience in which people do not so much command machines as enter into conversations with them. . . . It encouraged play and tinkering. Mastering the

Macintosh meant getting the lay of the land rather than figuring out the hierarchy of underlying structure and rules" (34-35).[22] The play and conversation, however, exists only at the interface level, and the true workings of the machine are concealed. While countless arguments have been made as to why closed, proprietary systems harm society as a whole, despite their profitability to large corporations and their utility to masses of consumers, the one that I think is most fitting here is made by Rushkoff, when he compares dependence on proprietary software to dependence on private automobiles. "Throughout the twentieth century, we remained blissfully ignorant of the real biases of automotive transportation. We approached our cars as consumers, through ads, rather than as engineers or, better, civic planners. We gladly surrendered our public streetcars to private automobiles, unaware of the real expenses involved. . . . As a result, we couldn't see that our national landscape was being altered to manufacture dependence on the automobile" (137-138). Likewise, the outcomes are diminishing capabilities of Americans, and increasing dependence on machines and other societies. Citing Rushkoff again, "the more we learn to conform to the available choices, the more predictable and machinelike we become ourselves. We train ourselves to stay between the lines, line an image dragged onto a snap-to grid. . . . Likewise, through our series of choices about the news we read, feeds to which we subscribe, and websites we visit, we create a choice filter around ourselves" (59). The games and entertainment never seem to end; digital media provoke an undead quality in comparison to printed material because each button and hyperlink leads users on to additional content. To Chun, this compelling 'undeadness' of new media is related to the logic of programmability, in which programmed visions create futures based on past data (*Programmed Visions* xii). We are set on the trajectory of becoming *WALL-E* humans, characterized by entrained striations, choice filter creation, and programmed visions.

Acknowledging this condition of programmed docility evokes practical and philosophical questions of what and how to know, to self-determine oneself as a person navigating the postmodern,

built environment. Andrew Feenberg, invoking influential philosophers of technology, argues that to Jürgen Habermas, colonization of the lifeworld by system is the central social pathology, and to Albert Borgmann, individuals have been demoted to disposable experiences where they were once commanding presences (*Questioning Technology* 167; 190). Robert R. Johnson, in *User-Centered Technology: A Rhetorical Theory for Computers and Other Mundane Artifacts*, explains how system-centered models of technology embody the designer image, so that it appears the system is driving the user, answering with the call to add users' situations to design models, representing user activities of learning, doing and producing (26-29). Turkle's position is that popular software is designed for immersion; thus, programming skills are no longer required for full membership in computer culture (*Life on the Screen* 61). To Kitchin and Dodge, we are in the era of *everyware*, “in which computing becomes pervasive and ubiquitous. In this new era, software mediates almost every aspect of everyday life” (9). As Rushkoff puts it, “digital technology doesn't merely convey our bodies, but ourselves. . . . They are fast becoming the boundaries of our perceptual and conceptual apparatus; the edge between our nervous systems and everyone else's, our understanding of the world and the world itself” (138-139). In this vein, Herbert Simon refers to Gresham's Law of Planning, in which programmed activity drives out nonprogrammed activity like the Freudian ego over the id (67). Provisions must be made to maintain nonprogrammed decision making responsibilities: does this trend contribute to our stupefaction? In the economic and social sphere, Jaron Lanier contends that value collectively created by ordinary users is atomized, and a new form of alienation of labor saps value from the middle class and keeps the weak weak, does not strengthen or make them smarter; “instead of enlarging our overall economy by creating more value that is on the books, the rise of digital networking is enriching a relative few while moving the value created by the many off the books" (2).

These are parts of a growing tale of 'dividual' subjectivity, to employ a key term of Deleuze's brief work “Postscript on the Societies of Control” that will be elaborated in the next chapter. The

premise is that the individual of Enlightenment modernity has been subdivided to the point where its significance is wholly in terms of various constitutive mechanisms of control, rather than something that exceeds their aggregate.[23] At the same time, the role of fantasy in depicting computers that characterized their early years has been supplanted by a familiarity that Turkle warns in her 2011 book *Alone Together: Why We Expect More from Technology and Less from Each Other,* draws humanity toward the *robotic moment*, when we deem the responses of artificial agents as adequate substitutes for human relationships. As Johanna Drucker and Emily McVarish discuss in their history of graphic design, "as computers became an object of popular imagination in the 1950s, graphic depictions of them and uses of their imagery ranged from literal to fantastical. . . . Individual preference, emotional response, and cultural or gender differences had no place in these systematic processes – or in the graphic design of their operation – even when what was being depicted was fraught with such factors" (253). Still, people project affect onto computers. According to Turkle, while portrayals of the inanimate coming to life range from horrifying to gratifying, the opacity of robot programming forces behavior as with an likewise opaque human, at interface level (68). Programs are now designed to convince us they are adequate companions, raising for her the concern that promises of robotic solutions are defaulting, and our practice interacting with robots is accustoming us to reduced emotional ranges. Affective computing is thus attempting to steer technological evolution by adding a winning personality to ease of use, threatening reduction of affect like symbolic intelligence has already been reduced. She notes that computer scientist John Lester makes optimistic predictions that humans will fill robots with the same personal history as their smart phones today: "our rooms will be our friends and companions" (141). Like the robots belonging to Tony Stark in the *Ironman* movies, the animated butler, prosthetic suit, and coded space of the room itself will create true cyborgs. Sociable robots are imagined as people, and people online are imagined as objects.[24]

Turkle unloads a lifetime of clinical research and interviews with leading computer scientists as

she makes her arguments for why we expect more from technology and less from each other. Another symptom of the dividual is that the social judgment of multitasking has shifted from blight to virtue, in spite of psychological research, due, she claims, to the neurochemical high it produces. Moreover, it is the feeling of creation in games, not creation or its pressures, that is the sweet spot of simulation.[25] Arguments that disparage books as disconnected appeal to idealized online reading practices, ignoring daydreaming and introspection that used to attend reading books, and along with multitasking often do not inspire heroic narratives, but instead new anxieties. Online confessional sites can be viewed as symptoms visited to relieve anxieties. Postfamilial families assemble alone together with their devices. In summary, Turkle does not blame technology for creating myths people believe that it does not matter they are disappointing each other. The Internet gives us new ways not to think by keeping us busy externalizing problems, recalling Weizenbaum's absent mind. Worse, extreme self-policing aims for a pre-corrected self, a new regime of self-surveillance, which many connect to Foucault's notion of panopticism. Thus the anxiety of always replacing one's protean self in the earlier Internet has been replaced by new anxiety of the persistence of people and data, which leaves no psychosocial moratorium or separation with the past, leading to fictional Peter Pan beliefs that there is no electronic shadow (260). These are the real consequences of loss of privacy for intimacy and democracy. Turkle concludes that the idea of robotic companionship serves as a symptom exploiting disappointments with other humans, and dreams for relationships we can control. At the same time, conventional wisdom is dangerously inadequate, taking performance of emotion by caring machines as emotion enough. We are at the center of a perfect storm, tempted by sociable robots to complete the arc started by Bauerlein's critique of overwhelming social media technologies, leading to not only programmed visions of Chun but programmed emotions, expectations of simplified and reduced relationships with each other. In a sense, the quintessential postmodern object is not simply the GUI-enabled personal computer, but rather the human plus computer assembly that I will articulate more fully in the second chapter.

Foss Hopes

When Brin accentuates the absence of modern programming languages providing any easy, effective, interesting pedagogy like the old BASIC, his concern begs the question of how America will fill the next and future generations of programmers; outsourcing, visas for foreigners, increased automation are all suggested. Consequently, trust in automatic renewal of the technology workforce may be another failing, stupefying assumption of our era, exacerbated by the shortcuts in deliberation noted by Postman, Winner, and Weizenbaum. French philosopher Felix Guattari, writing about technogenesis, contends that “maintenance of the consistency of machinic ordering requires that the quotient of human gesture and intelligence that figures in its composition must also be renewed. . . . The reproducibility of machines is thus not a pure, programmed repetition” (18). He continues by distinguishing between the sort of standalone, autonomous operation of nonhuman machinery popularized by Francisco Varela, and “a more collective machinism, without delimited unity and whose autonomy meshes with diverse bases for alterity,” the very sort of human/machine cyborg we now theorize. Turkle also observed three categories of comportment toward computers, or different styles of relating to the machinic: hacker, hobbyist, and user. “The hacker style made an art form of navigating the complexity of opaque computer microworlds. . . . For hobbyists, the goal was to reduce a machine to its simplest elements in order to understand it as fully as possible. . . . In the early days of the personal computer culture, a satisfying understanding of the central processing unit (CPU) of home computers was turned into an ideal for how to understand society; the rules of the community should be transparent to all its members. . . . A user is involved with the machine in a hands-on way, but is not interested in the technology except as it enables an application" (*Life on the Screen* 32). Note the hint at a crossover between understanding the CPU and social harmony. What Brin and Rushkoff fear, and many others sense as well, is that the user mentality has prevailed, perhaps to the point that the primary

purpose of computers is to keep humans busy, turning us all into Weizenbaum's computer bums, with pale skin, disheveled clothes, and bloodshot eyes. To historian Martin Campbell-Kelley, the history of the modern computer as information machine concludes with commerce, recreation, and socializing, all seeming to have replaced the initial excitement of access to knowledge that the Internet offered (284). To emphasize this point, Ian Bogost went as far as to make a social media game called *Cow Clicker*, whose sole objective was to click colored cows with the mouse pointer, forcing philosophical reflection on just how stupid humans are becoming to win a silly award by clicking nothing (Tanz 118). In *Alone Together*, Turkle relates a curious story from her years of fieldwork among top computer scientists and AI researchers, when a group of them were asked to brainstorm what everyday people would do with home computers to keep the latter busy and not waste the processing cycles of then expensive equipment. “My notes from this meeting show suggestions on tax preparation and teaching children to program. No one thought that anyone except academics would really want to write on computers. Several people suggested a calendar; others thought that was a dumb idea. There would be games. . . . Now we know that once computers connected us with each other, once we became tethered to the network, we really didn't need to keep computers busy. *They keep us busy*. It is as though we have become their killer app” (279-280). However, maintaining and augmenting the machinic realm constitutes far more than faithfully applying updates, clicking through notices, and otherwise shepherding devices through their consumer life cycle from purchase to disposal. Therefore, the threat of the dumbest generation extends into the machinic, for even if it is hyperbole to declare us their sex organs, they still need us nonetheless.

According to Rushkoff, while teaching kids to write *with* software seems enough of a response to the formerly unidirectional, producer-biased mass media, they should be *writing* software. “But the underlying capability of the computer era is actually programming which almost none of us knows how to do. We simply use the programs that have been made for us, and enter out text in the appropriate box

on the screen. We teach kids how to use software to write, but not how to write software. This means they have access to the capabilities given to them by others, but not the power to determine the value-creating capabilities of these technologies for themselves" (19). It is no surprise, then, that Lessig claims a huge proportion of American population regularly violates copyright and other intellectual property laws while deeming itself a free society (*Free Culture* 201), or that Turkle's interviews reveal young people believe digital memory will create a more tolerant society, and their favorite websites are run by good people of their generation and ignore their actual corporate governance (*Alone Together* 255). Her insight connects well with Lanier's critique of the siren servers at the heart of the Internet. Such are the degrees of freedom users must negotiate.

To suggest the underlying capability of the era is programming feeds the critique of technology made famous by Heidegger, especially in his Nietzsche lectures, where he exclaimed, "what is needed is a form of mankind that is from top to bottom equal to the unique fundamental essence of modern technology and its metaphysical truth; that is to say, that it lets itself be entirely dominated by the essence of technology precisely in order to steer and deploy individual technological processes and possibilities" (117). Deleuze and Guattari talk of "the installation of a central computing hole without which no message would be discernible and no choice could be implemented," and imply that programming as a means of practicing subjectivity, like linguistics, are incompatible with being a child at play; "linguistics can tolerate no polyvocality or rhizome traits: a child who runs around, plays, dances, and draws cannot concentrate attention on language and writing, and will never be a good subject" (*Thousand Plateaus* 179-180). While perhaps not fit for children, however, contrast this positive view given by Steven Levy of time spent experimenting and hacking to Heidegger's Nietzschean overman and Weizenbaum's computer bums: "Hackers felt otherwise: anything that seemed interesting or fun was fodder for computing–and using interactive computers, with on one looking over your shoulder and demanding clearance for your specific project, you could act on that

belief. . . . If everyone could interact with computers with the same innocent, productive, creative impulse that hackers did, the Hacker Ethic might spread through society like a benevolent ripple, and computers would indeed change the world for the better" (*Hackers* 46-49). On the one hand, philosophers wish to protect the wanton, rhizomatic traits of predigital humanity from submission to machinic ordering, from becoming posthuman cyborgs. Weizenbaum makes his skepticism plain whether the revolutionary spirit is really present in movers and shakers in computer fields. David Golumbia, in *The Cultural Logic of Computation*, buttresses Winner's mythinformation hypothesis. "We don't see people who use computers extensively (modern Americans and others around the world) breaking out everywhere in new forms of democratic action that disrupt effectively the institutional power of capital, yet our discourse says this is what computers bring. Our own society has displayed strong tendencies toward authoritarianism and perhaps even corporate fascism, two ideologies strongly associated with rationalism, and yet we continue to endorse even further tilts in the rationalist direction" (26-27). On the other hand, the thrilling experience of creating new things by programming computers suggests an avenue for revolutionary spirit to express itself. Lyotard wrote in *The Postmodern Condition* that "even today 'wildcat' activities of technical invention, sometimes related to *bricolage*, still go outside the imperatives of scientific argumentation. . . . The games of scientific language become the games of the rich, in which whoever is wealthiest has the best chance of being right" (44). Bricolage, wildcat technical activities may be on the fringe now, beside institutionalized innovation practices, along with the lone genius, yet the spirit is redeemed during initiation of disruptive technologies like the personal computer, Internet, and smart phones. As Heidegger loved to quote the verse of Hölderlin, "But where danger is, grows the saving power also" ("Question Concerning Technology" 34). There may be hope for the dumbest generation.

We still have to contend with the fact that something went awry. Kemeny had predicted an explosion of jobs for editors following the computerization of libraries, "since no item could be

inserted in the automated library without a carefully written abstract and careful cross-indexing for the purposes of subject-matter search," (96) that did not occur. Instead, amateur, ad hoc content arrangement in the absence of consciously crafted metadata contributes to an information landscape mirroring urban sprawl. An alternative, of course, is to have the machines do the organizing, at the peril of progressively giving up our ability to oversee their reasoning. Code, to Kittler, presents an insoluble dilemma yielding random buzz either way. "The so-called 'hidden layers' in today's neuronal networks present a good, if still trifling, example of how far computing procedures can stray from their design engineers, even if everything works out well in the end. Thus, either we write code that in the manner of natural constants reveals the determinations of the matter itself, but at the same time pay the price of millions of lines of code and billions of dollars for digital hardware; or else we leave the task up to the machines that derive code from their own environment, although we then cannot read – that is to say: articulate – this code. Ultimately, the dilemma between code and language seems insoluble" ("Code" in *Software Studies* 45-46). With humans merely tending their server farms, extended cognition descends into necessarily inexplicable, incomprehensible, unphilosophical zones and temporal orders of magnitude. Kittler's disheartening conclusion, in my opinion, is that instead of studying code we must be good scholars and cultural observers. For he judges the division between code and discourse insurmountable, ending his musings on code in the *Software Studies* lexicon with the judgment that "anybody who has written code even only once, be it in a high-level programming language or assembly, knows two very simple things from personal experience. For one, all words from which the program was by necessity produced and developed only lead to copious errors and bugs; for another, the program will suddenly run properly when the programmer's head is emptied of words. And in regard to interpersonal communication, that can only mean that self-written code can scarcely be passed on with spoken words" (46).

Kittler's pronouncement, if he meant it to be taken seriously, directly contradicts the

epistemological and hermeneutic aims of textual analysis, foreclosing the nascent disciplines of software studies and critical code studies from direct focus on their subject matter. The emergence of free, open source software (FOSS[26], henceforth foss) in the late 1990s onward seemed to provide avenues both to study hitherto inaccessible source code, and give individuals and ad hoc collaborations an advantage in technical invention by leveraging Internet resources without the overhead of institutional and corporate protocols.[27] While Richard Stallman's insistence that the scarcity of willingness to work together for the public good, not scarcity of technical innovation, is the root evil of non-free software (“Why Software Should Be Free” 124), the fact that a generation or more has grown up learning to use applications and tinker with settings, instead of literally writing code, should be considered as contributing to making us dumber collectively. Some misconceptions need to be dispelled, what I call *foss hopes*, as the putative revolutionary, democratizing, ennobling potential inherent in free, open source software, which seemed poised at the turn of the twenty-first century to reverse the negative dominance of closed, proprietary software systems that more than anything else demonstrated the truth behind the claims that digital media is big business, and more concerned with profit than preventing the dumbest generation. Myself and many others may have made what I call the *Theuth error*, in honor of the Platonic myth, expecting more from foss as epistemologically enlightening, and economically and socially democratizing, empowering the little people towards the equity imagined by Lanier built up from lifetime network activity as some strange new kind of individual property. The initial exuberance heralded by works like Eric S. Raymond's *The Cathedral and the Bazaar*, Linus Torvald's *Just for Fun*, and countless opinion pieces that followed the maturation of GNU/Linux and other foss alternatives to commercial applications from fringe to mainstream use has since been tempered by the findings of empirical research, for example Feller et. al.'s *Perspectives on Free and Open Source Software*, now nearly a decade old. Research shows that as they mature, free, open source development communities adopt the useful behaviors of corporate norms, and become

more like them. Ethnographic studies like Yuri Takhteyev's *Coding Places: Software Practices in a South American City* reveal entrenched Anglocentrism in both programming language design, actual code bases, and community discussion forums. Moreover, central to Lanier's argument that siren servers have corrupted the Internet is the fact that “the illusion that everything is getting so cheap that it is practically free sets up the political and economic conditions for cartels exploiting whatever isn't quite that way. When music is free, wireless bills get expensive, insanely so. You have to look at the whole system” (18). Foss made cheap networking possible, and the illusion Internet services are free, as in free beer, conceals the social costs of the arrangements that have developed, like the hidden costs of our culture built around private automobiles that Ruskkoff criticizes. Finally, we still have not reached the point where, as humanities scholars steeped in technological interests, we talk and write about code rather than around its peripheries. We are in default, the dumbest generation, practically and philosophically. Defaulting, we depend upon large corporations to provide and manage cyberspace, though I will suggest that we can home in on *default philosophies of computing*, by studying the writing, code, and engineering work of dominant technologists who have held sway over human populations over certain time frames in the short modern history of computing.[28] Recognizing deficiencies in our foss hopes leads to insights into default philosophies of computing of the technological era through which our souls travel.

Default Philosophies of Computing

The basic idea is that academic debate inspired by a philosophy of computing tradition is still unconscious of its preference formation; there is no philosophy of computing tradition yet, although there are philosophies of information, semiotics, software, computer ethics, and so on. Indeed, the philosophy of technology has only gained disciplinary recognition since the 1970s, according to Don Ihde (14). Carl Mitcham divides the philosophy of technology into *engineering* and *humanities* tracks

in his well known book *Thinking Through Technology*, the former “analyzing the internal structure or nature of technology,” and the latter “undertaking a humanities analysis of the broad spectrum of engineering and technology,” but noting “it has failed to pay sustained or detailed attention to what really goes on in engineering and technology” (ix). Terrell Bynum and Simon Rogerson, in their introduction to *Computer Ethics and Professional Responsibility*, trace computer ethics back to Norbert Wiener's work at MIT during World War Two, when “the engineering challenge of this project caused Wiener and some colleagues to create a new field of research that Wiener called cybernetics – the science of information feedback systems,” followed by the publication of *The Human Use of Human Beings* in 1950, which “laid down a comprehensive computer ethics foundation which remains today (more than half a century later) a powerful basis for computer ethics research and analysis” (7). As they continue this brief history, “in the mid-1970s, philosopher (and later computer science professor) Walter Maner began to use the term computer ethics to refer to that field of applied ethics dealing with ethical problems aggravated, transformed, or created by computer technology. . . . Maner's trailblazing course, plus his *Starter Kit* and the many conference workshops he conducted, had a significant impact upon the teaching of computer ethics across America” (9).[29] They situate the mid 1980s as a watershed period for scholarly interest in computers and philosophy, noting the publication of James Moor's famous article “What Is Computer Ethics?” and Deborah Johnson's *Computer Ethics* textbook in 1985, Sherry Turkle's *The Second Self* a year earlier, and Judith Perrolle's *Computers and Social Change: Information, Property and Power* in 1987 (9-10). Moor urged that the rapid changes occurring in technology sectors outstrip the ability to fully appreciate their social consequences, creating what he called *policy vacuums* – and of course a call for responses from philosophers, social scientists, and other humanists.

It is instructive to survey the transformations of Johnson's long-running textbook on computer

ethics. The impact of computers was not yet judged fundamental like the Industrial Revolution; thus the first edition of *Computer Ethics* appeared in a series on occupational ethics in 1985. She credits the work as the first attempt to bring philosophical thought to ethical issues surrounding computers, Wiener notwithstanding (5). The book focuses on the significance of moral issues for computer professionals that are dealt with at the level of social policy or individual responsibility. It does not discuss popular topics like the uniqueness of human intelligence, the Turing Test, and so on, for their lack of specificity.[30] Computer use has created not unique ethical questions but new forms of raising them, a position held through the current, fourth edition. For instance, hacking is summarily judged as having no moral distinction to physically breaking into an office and stealing files; many moral issues are similarly dissolved by finding adequate comparisons between activities done with computers and familiar actions (2). Other cases draw ordinary moral rules into unfamiliar areas, which Moor calls conceptual muddles. The chapters of the first edition progress through an introduction to ethical concepts, consideration of professional ethics including the ACM *Code of Professional Conduct*, responsibility and liability, effects resulting from increasing use of computers on privacy, on power relations, and finally regulating ownership of software. Looking back in the preface to the fourth edition, Johnson saw her task as an early philosopher of computer ethics to distinguish hype from serious analyses, using the strategy of identifying what remained the same versus what really changed in society as well as taking into account the multidirectional relationship between technology and society (vi). In my opinion, the earlier editions may make good use of the ancient philosophy genus and species distinctions, but seemed to pay lip service, at best, to any technical details of their subject matter – which can be excused for the sake of the intended audience precisely for not being programmers, engineers, project managers, and so on – but also fail to take in the nuances, for example, of the foss movement, revealing an approach to philosophy uninformed through either becoming itself technologically adept, or through deep alliance with technologists, and consequently failing to think

clearly about the subject matter. Its sole reference in the third edition, from 2001, by which time foss was the talk of technology circles, and 'open source' had already become a metaphor applied to other domains, takes the form of a dreadfully misconstrued footnote: “Perhaps, the best example of successful shareware is the Linux operating system” (160).[31]

The additional voice of computer scientist Keith Miller for the fourth edition fills gaps Johnson recognized in her previous scholarship, balancing desires to protect the integrity of computer science while attempting to provide accessible details to less technically sophisticated readers (vi). This helps avoid indulgence of rationalized ignorance that opens her former approach to computer ethics to similar criticisms Bauerlein makes of adolescents missing their own connections to tradition.[32] However, 'information technology' (IT) replaces 'computer' for rest of book following the first chapter. Johnson contends that by now (2009) the extensive influence of computers on society is taken for granted. The book's focus moves away from uniqueness and addressing computing professionals, to how computer ethics and its encompassing IT fits within any cultural milieu of information societies, late capitalism, and digital order.[33] The “why computer ethics” metaquestion now involves clusters of issues surrounding the putative uniqueness of situations created by information technologies with respect to traditional ethical approaches, such as security, justice, and other basic rights long granted humans but not machines so long as the foss freedom zero prevails, represented by notion of threshold for future machine processing after all copyrights expire making equivalent to contemporary foss licensing, for example some version of GPL. Johnson and Miller propose a more general perspective connecting ethics and technology than its prior focus on the uniqueness of new computing technologies, which she calls the standard account. This refers to Moor's argument that new possibilities created by computers raise ethical questions. For Moor task of computer ethics is filling policy vacuums by sorting out conceptual muddles, for example conceptualizing computer software to best fit prevailing intellectual

property law. Thus we had a philosophical period dominated by Microsoft litigation as the voice of the little people against collective machine mind. She argues that policy vacuums are often filled by default responses that perpetuate existing tensions or bad policy decisions, all of which ethical analysis may reveal. Johnson finds that our responses to emerging technology are further conditioned by conceptual models, such as the promotion of lifelong learning as a means to advance oneself in the age of global capitalism. Moreover, people already have well developed expectations and conceptual models about computer technologies; simply put, they are no longer new. Thus, the standard account is not specific to IT but rather focuses on new technologies in general at their introduction stage.[34] Their new sociotechnical systems perspective is intended to widen the scope of IT ethics to the complete lifecycle of technology systems, away from emphasis on newness and other shortcomings of the standard account. For example, consider looking at the *end* of life of technologies for retrospective study and learning, such as Manovich proposes for cultural software.

Still using provocative scenarios targeted at college-age students, the latest edition of *Computer Ethics* continues to make the familiar call: “if we have any hope of steering the development of future technologies in a direction that is good for humanity, that hope lies in understanding the social and ethical implications of our choices about IT” (5). She believes better choices will derive from better understanding about sociotechnical systems. Computer ethics focuses on the role of IT in constituting the moral world – if only computer ethics led technology rather than followed it (viii). She gives examples of technology following ethics to demonstrate the need for technologically savvy philosophers and everyday users. A role for philosophers of computing to play in design is missed when the presumption of technological determinism shunts consideration of different possibilities, though Johnson notes Nissenbaum's TrackMeNot application, based on a value sensitive design approach of IT ethics (12). Yet even with the oversight of a computer scientist, the current edition

contains surprising inaccuracies in basic personal computer history, for example confusing the invention of the Macintosh for the Apple I, and consequently the GUI ahead of the command line, while making the larger point about the privileged context of the founding of Apple by some relatively affluent teens in a suburban family garage. “The garage had electricity, and Wozniak had been trained as an electronic engineer. The new computers they designed used the existing technologies of mouse and on-screen icons” (12). The thread of her overall argument gets interrupted by the reader's realization that she does not know what she does not know about these radically different machines at the extreme poles of the deep versus interface level understanding and engagement of the system. How much more unlikely, then, would it occur for one to consider the punch card machinery or the algorithmic musings of those system programmers of the Nazi regime and the IBM employees who guided them?

I have alluded to that trajectory from past to present into the future with the images of the Dehomag advertisement and the *Axiom* passengers of *WALL-E*. As World War II wrapped up in Europe, Allied troops were instructed to locate and rescue the valuable Dehomag equipment, anticipating the 2014 movie *Monuments Men*, in which special regiments were organized to preserve artwork and other cultural treasures. As Black points out, often the same devices used by the Nazis was quickly repurposed for running hastily reconstituted bureaucracies in the occupied territories. Thomas Watson, Sr. and IBM U.S. kept out of reparations discourse to quietly continue developing and profiting from computing machinery, quickly settling on a restitution resolution for its property damaged during the war (419). Moreover, while employees from corporations in other industries were being scrutinized for war crimes, no one from IBM was prosecuted, not even top German Dehomag employees and shareholders who had been members of the Nazi party, from the chief shareholder and owner of the Hollerith patents Willy Heidinger, whose name bears an uncanny resemblance to that other infamous

Nazi sympathizer and chief philosopher of technology Martin Heidegger, to scores of Eichmann-level individuals, many of whom may be named in the lost *History of Computing in Europe*. Instead of being implicated in war crimes, IBM was an important contractor providing media services enabling the Nuremberg Trials, doing functions we now associate with IT. “Indeed, the trial process was slowed by the necessity of translating all documents, exhibits, and testimony into several languages of the war crime tribunal French, Russian, German, and English. Justice Jackson turned to a newly invented process called simultaneous translation. One company reviewed all the evidence and translated it not only for real time usage at the trial proceedings, but for posterity. That company was International Business Machines. It made the final translated record of all evidence back and forth from French, Russian, German, Polish, and English. Watson offered to undertake the massive evidence handling free of charge" (421).[35] However repulsive, our national characters are part of this collective intelligence, for the computers, programming languages, business processes, and corporate organizations we use today are their direct progeny.

The ubiquitous presence of IBM machinery throughout WWII on all fronts, in railway depots, concentration camps, in calculation centers predicting public reactions to carpet bombing campaigns, afterward in simultaneous translation technology at the Nuremberg Trials, then finally deployed with Watson's blessing inFather Roberto Busa's computerized linguistic analysis of the Aquinas concordance powering the first large scale digital humanities project, is repeated in *WALL-E* in the *Axiom*'s gallery of portraits featuring the omnipresent Auto Pilot ship's wheel alongside its successive generations of human captains. Try to imagine that image. The smooth operation of German railways, the political decision to use atomic bombs, were supplied by early versions of technologies that Bill Gates sees on the horizon in his 1995 book *The Road Ahead*, the same ones that are under intense scrutiny today following the revelations by Edwin Snowden over NSA data collection practices. In *The Road Ahead*,

published two decades ago, Gates wrote that “it might take only a few more incidents like the bombing in Oklahoma City within the borders of the United States for attitudes toward strong privacy protection to shift. What today seems like digital Big Brother might one day become the norm if the alternative is being left to the mercy of terrorists and criminals. I am not advocating either position – technology will enable society to make a political decision” (269-270).[36] Gates' claim begs the question, *how exactly do we philosophize about computing?* He thinks from his incredibly privileged perspective, yet it is still a human perspective mediated by the computing machinery of the time. Walter Ong made the good point that once the word is technologized, it must always be criticized with state of the art technologies *of the word*, which seems to lead to a paradox or at least dilemma at the heart of any philosophy of the word, similarly articulated by Kittler concerning any philosophy of code, leaving computing and programming to default philosophers who are industry leaders, and the instantaneous empirical eighty percent, rather than academics. Pot shots have been taken at the old vanguard. Michael Heim, encountering an electronic analysis of different versions of *Being and Time*, writes that “Heidegger speculated an all-enframing *Gestell* [technological system], ominous and threatening, but an abstraction looming like a metaphysical sphinx, terrorizing thought with a puzzling lack of specificity. Now here was computer text concretely manifesting that abstraction. . . . Heidegger was now on computer" (“Computer As Component” 304-305). David Golumbia recounts the famous example of Chomsky disparaging Foucault and Lacan on early social media: “in a widely circulated Usenet text whose authorship Chomsky has never disputed (Chomsky 1996), and which strongly resembles many of his other writings in tone and subject matter, Chomsky explains that Foucault offers simple and familiar ideas . . . dressed up in complicated and pretentious rhetoric and that Lacan, whom Chomsky met several times, was an amusing and perfectly self-conscious charlatan" (33n1). He recognized these guys were clueless to the issues he felt were important regarding language and intelligence. Bruno Latour exclaims that “there is no greater intellectual crime than to address with the equipment of an

older period the challenges of the present one" ("Why has Critique Run out of Steam?" 231). Verena Andermatt Conley writes in the preface to *Rethinking Technologies*, "as electronic communication and accelerated modes of transportation shrink our planet more and more and more, technologies are often assumed to be the science of either salvation or human damnation. On the one hand, postmodern celebrations of contemporary technology and related cultural sensibilities as the most varied, mixed, and 'advanced' assert that they are so beneficial they even help women and other cultural minorities gain higher status. They accomplish what humanistic discourses could never do. On the other hand, elegies on the death of nature and the dangers of automation and dehumanization counter the expression of praise" (ix). The postmoderns are the very ones who talk about their Macintosh while still writing books; their hearts are in the right place but minds focused on the previous technological era. It is perhaps a problem of how philosophers philosophize, that we get these default philosophies of computing, when they approach computing, sensed by Chomsky of Lacan and Zizek, Heim of Heidegger, and epitomized by Latour when he deprecates using old tools for working on new problems? At the same time, there is at this border of a place for thinking the most powerful and the most thoughtful do not enter, that system designers and programmers regularly explore.[37]

Deborah Johnson, reflecting back on the technological milieu of first edition of *Computer Ethics* in awe of the changes that have taken place, traversing memories of awkwardly writing that book with an eight bit Osborne, to networked, thirty-two bit devices captivating her teenage daughter, and herself captivated by her word processor and other professional philosophers' equipment.[38] She overviews the changing ethical focus over the customary historical periods of modern computing, beginning in the 1960s with fears surrounding challenges of computer as opponent and potential catastrophes of automated decision making, noting popular science fiction and work of James Moor. Issues in the late 1970s focused on data collection and threat of big government, which Black echoes in

his study of IBM and the holocaust, and Weizenbaum and Mowshowitz are noted as primary theorists. Focus shifted to ethical issues surrounding software in 1980s personal computer era, especially games, piracy, and hacking. Attention turns to the Internet in 1990s as traditional media are transferred and recreated in digital media, exacerbating past privacy, democracy, and property issues. Finally, she hints at future visualization and virtual reality topics. Johnson contends that the goal of ethics built into design is still not treated seriously by scholars in computer ethics.[39] As long as we cast computer and IT ethical issues as new species of generic moral issues, we need to consider implications of their instrumentation of human action (third edition xii). Yet *Computer Ethics* really addresses at high levels multiple parts of a family of technologies dealing with information; Johnson never asks the fundamental philosophical question all the way through, like Heidegger did with thinking, of *what* is computing in the first place, or what does it mean to think like a machine. I wish to continue into the machinic by invoking discussions made in computer languages in program source code as part of my philosophical work. For we both agree that practical ethics negotiate between theory and real world situations, and if we are philosophizing with computers, about computing by, among other approaches, using them, then *working code* becomes part of contemplation.[40]

I am struck by the parallels between the hopes and fears new technologies evoke in the brief history of modern computing that I have surveyed, and the hints of similar critique discernible in ancient Greek and Roman philosophy, when the state of the art was new forms of handwritten alphabetic script rather than shimmering signifiers emanating from electronic circuitry. Both discourse networks, at the same time, are interrupted by actors who feel such topics are beneath the dignity of true lovers of wisdom. Ong, who is famous for making the distinctions between oral and literate cultures meaningful as societies are entering a third, post literate epoch, nevertheless shunned study of programming languages, even calling into question their legitimacy as such. In the opening pages of

Orality and Literacy, he turns away from computer languages and what could have become a lively subdiscipline, claiming there is an inseparable gulf between computer languages and languages growing out of unconscious over long historical periods. “We are not here concerned with so-called computer 'languages', which resemble human languages (English, Sanskrit, Malayalam, Mandarin Chinese, Twi or Shoshone etc.) in some ways but are forever totally unlike human languages in that they do not grow out of the unconscious but directly out of consciousness. Computer language rules ('grammar') are stated first and thereafter used. The 'rules' of grammar in natural human languages are used first and can be abstracted from usage and stated explicitly in words only with difficulty and never completely“ (7). Yet for prodigious programmers, whether self-taught or academically trained, BASIC, C++, or HTML may be as naturally learned as a foreign language. Even at the level of languages themselves, evolving over use in human communities, programming languages also share patterns of developed with spoken and written mother tongues, in the common algorithms implemented in millions of programs worldwide, and the evolution of languages standards through working groups rather than abstractly by bureaucratic committees.[41] If Ong is dismissing them on account of their un-naturalness, he is in line with a long tradition stretching back to the Roman philosopher Seneca, who asserted that the function of philosophy is to discover human and divine truths, looking back to a mythic age before marble and gold, and disagreeing with his rival Posidonius that the arts of daily life were invented by philosophy. “We know that certain inventions have been made within our own memory,” he writes, “as for example the use of windows which admit clear light through transparent panes, or vaulted baths with conduits let into the walls for diffusing heat which warms the upper and lower space alike. . . . And what of the stenographic symbols which can take down a speech however rapidly delivered and enable the hand to keep pace with the agility of the tongue? But these are inventions of low-grade slaves. . . . Wisdom's seat is higher; she does not train hands but is mistress of souls. . . . Then Wisdom begins to inquire into the soul – its source, its location, its survival, its divisions. . . . No, the sage did

not withdraw from the mechanic arts, as Posidonius thinks, but never touched them at all. The sage would never have esteemed an invention worth making if it was not likely to merit permanent use; he would not have taken up what would have to be laid aside" (232-234). The last phrase translates *ponenda non sumeret*. With that characteristic rhetorical flair of the Latin language to compress a complex argument into a few words, Seneca captures an essential dilemma at the heart of the philosophy of computing. When dealing with impermanent technologies subject to rapid cycles of innovation and obsolescence, today aggravated by Moore's Law, the thoughtful person does not want to take up that which must be so quickly put down, so that Kittler finds the dilemma between code and language untenable.

In this absence of a clear directive for philosophy to address computing, the void fills by default: futurists, technophobes, politicians, evangelists, industry leaders, portrayals in science fiction, and with the ideologies concretized in extant technological systems themselves. As a recent example, the 2014 film *Transcendence* dramatizes two long-standing dreams of artificial intelligence, the emergence of global machine intelligence far exceeding human ken, referred to as the singularity, and the duplication of human consciousness in those same systems. These are precisely the themes Ray Kurzweil promotes in his 1999 book *The Age of Spiritual Machines: When Computers Exceed Human Intelligence*, with the goal, he states, of enhancing predictions focusing on demographic, economic and political trends with emerging machine capabilities as intelligent agents (10). Donning the authority of a scientist, he argues that developing a written record of achievement is a key requirement for evolutionary processes, such as DNA encoding, casting DNA as software, read-only memory (ROM) controlling the machinery of life. For technology includes written record of tool making, which is essential for evolutionary processes, whether natural or artificial. To him, this places intelligent machines on the same level as intelligent organisms. From the Big Bang to evolution of life on Earth,

time moves in exponential fashion, seeming linear only when nothing much happens. At the transition from print literacy to machine intelligence, we are again in the knee of the curve when exciting things happen. He asserts that the formidable combination of human-level intelligence, high speed, extreme accuracy, and sharing ability of machines will challenge human mastery in many domains beyond playing chess. Therefore, identity questions will dominate politics and philosophy in the twenty-first century. The next evolutionary milestone will be autonomous technology creating its own next generation by leveraging the two crucial resources of internal, growing order, juxtaposed against unbounded, environmental chaos to feed computation. Unlike prior technologies, machines will provide their own innovation (think Kittler's automatic programming); three dimensional chip design, nanotube, optical, crystalline, DNA, quantum computing technologies keep the Law of Accelerating Returns going. Evolution speeds up by building on its own increasing order, and computation is the essence of order, making computational technology the quintessential evolutionary process, foreshadowing the singularity event by mid century, undeniably ushering in the age of spiritual machines (33; 105).

While we may smirk at Kurzweil's enthusiastic, often extreme rhetoric, he gives himself the license to prophesize because he has spent his career successfully developing innovative computer systems that perform, among other things, speech recognition, one of the early holy grails of the human-computer symbiosis identified by Licklider. Bill Gates, for a long time the wealthiest human being alive, also ranks among those I am calling default philosophers of computing because, through his dual role as cofounder with Paul Allen, and former head of Microsoft, he has been intentionally directing the fruition of his vision towards what he intones as the ultimate market and new form of human communication, made explicit in the 1995 book *The Road Ahead*, for what he then called the information superhighway. For many years, of course, he has been out of the limelight as a technology evangelist, but the influence of his plans in this book on the shape of the Internet as it exists today are

unmistakable. When he opines, “we've got a good number of years to observe the course of the coming revolution, and we should use that time to make intelligent rather than reflexive decisions,” (252) in the book's introduction, he expresses surprise at the misunderstandings about technology held by most people speculating about the information highway (xii). Gates takes the position of philosopher king, a big person of the developing projective city.[42] Using a travel guide metaphor insinuates an assessment of the opinions of everyday consumers having little importance beyond accepting the technologies that have been designed and marketed to them. For many years during the backlash against its monopolistic practices, sarcastic versions of its trademarked slogan “Where do you want to go today?” abounded. “Where does Microsoft want to drag you today?” becomes the response to years of its perceived heavy-handed shaping the technology landscape. He clearly states that Microsoft corporate strategy is following *his* visions of the information highway, in addition to listening to customers (276). Gates is optimistic of the predicted impact on the masses, reminiscent of Theuth from Plato's *Phaedrus*. The personal computer revolution Gates and Allen jumped into and fundamentally influenced will be followed by communications revolution, fundamentally shaped by the personal computer. He realizes that the Internet is the most important computing development since the IBM PC, and hopes and intends that Microsoft will play a major role in constructing the information highway.[43] The analogy to the physical highway system Rushkoff decries as having developed through ordinary citizens' ignorance of the workings of the automobile industry is palpable.

Trickle down prosperity might be described as an underlying philosophical position of Gates; shifting richness defining the good life is first enjoyed by the few, then served up to the masses. Thus changes to architecture later studied by Kitchin and Dodge are theorized and tested with the extravagant house Gates is building when he writes this book. He also sees unproblematic whether our mediated interactions are with other people or with simulations, as long as our desires are fulfilled. He argues the contrary case to the fear that the information highway will turn homes into cozy

entertainment providers, in a prelude to Turkle's catchphrase “alone together.” When it comes to the large effects on society, his argument is that few business sectors have been hurt by the PC, and job categories are always changing anyway. His primary concern is the dislocation of workers, creating a need for retraining that will in turn create more jobs, not to mention revenues for technology companies. However, he ignores shift to flexibility and part-time status imposed on workers so important to Luc Boltanski and Eve Chiapello in *The New Spirit of Capitalism*, which will be discussed at length in the next chapter. While there will be new competition for knowledge workers in industrialized countries, the net effect will be wealthier world (261). Consequently, he is not worried about any violent revolution over expectations by the disenfranchised, or xenophobia due to mass immigration of highly skilled foreign workers: egalitarian access to most information democratizes and implicitly dissolves differences resulting from other factors. “Access to government information, medical advice, bulletin boards, and some educational material will be free. Once people are on the highway, they will enjoy full egalitarian access to vital on-line resources. . . . Part of the beauty of the electronic world is that the extra cost of letting additional people use educational material is basically zero” (257). Settle for virtual equity, as if access to information equalizes social situations. While media advances affect politics, he argues that the information highway will empower citizen interest groups, and allow even the smallest cause to be debated, ignoring the enormous magnification of influence it also provides to entrenched powers. He casts ethical problems surrounding information as intellectual property similar to medicine, focusing on high development costs rather than manufacturing and distribution (259).

Yet in the end, Gates concedes that his beloved technologies are not omnipotent. Fundamental social problems need fixed; “all this information, however, is not going to solve the serious problems facing many public schools today: budget cuts, violence, drugs, high dropout rates, dangerous neighborhoods, teachers more concerned about survival than education. Offering new technology won't

suffice. Society will also have to fix the fundamental problems. . . . It's always taken an intense local effort" (197).[44] On the contrary, Bauerlein argues the lowered friction of distribution by Internet has dampened tradition and allowed closed circuits of self-selected media consumption cycles dominated by low word count social messages to dominate. Gates' final critical assessment is that information highway will provide expanded choices for connecting people with entertainment, information, and each other. These predictions about transformations brought about by faster PCs and the information highway are literally queuing up the *projective city* of the new spirit of capitalism articulated by Boltanski and Chiapello. His advice is to become informed consumers, sidestepping issue of participatory involvement or outright rebellion. Gates believes the availability of information will spark curiosity, whereas Bauerlein argues that unguided and uninformed by tradition, children are lured into limited peer interests. Nonetheless, Gates embodies and enacts his philosophy of computing, while Bauerlein and Johnson merely comment about it; practice versus passive experience with technological devices, giving his words a sort of ontological precedence. If we do not want to be dragged into our relationships with technology, then we must surpass these default philosophies of computing. Digital humanities solutions present themselves as new ways to approach this goal.

Digital Humanities Solutions

A problem for the philosophy of computing is the apparent stagnation of the continuous iterative augmentation of human intelligence, while machine cognition skyrockets, and self adjusting networks take off and take command of their own affairs in ways unknown to their former masters, putting us on a trajectory whose destiny is peripheral characters, couch dwelling spaceship inhabitants subject to the control systems built into the environment that is Spaceship Earth. While this trend has inspired numerous science fiction dystopia narratives, its mundane effects are noted in the failures of American education to create new generations of STEM workers, addiction to electronic devices,

mounting cybercrime and cyberwarfare statistics, and decline in humanities and liberal studies. This does not make sense at the actor network level, for we can hardly believe that the machines have not stopped depending on us, leveraging our unsatiable use of them to keep building on to their collective mass, a need sensed by Turkle throughout her career, and made clear in *Alone Together*. Technology, to express its unconscious, wants to be a symptom. “Kevin Kelly asks, What does technology want? and insists that, whatever it is, technology is going to get it. Accepting his premise, what if one of the things technology wants is to exploit our disappointments and emotional vulnerabilities? When this is what technology wants, it wants to be a symptom" (282). To interpret symptoms in sets of conditions, contexts, situations, places, to feel the slippage between what is assumed to be uniquely human into the inhuman, transhuman, machinic, posthuman, cyborg – yet even the ways we ask philosophy of computing questions are affected, particularly if we are not experienced programmers and technologists: that is the stake of my wager. My thesis, in three brief points, is first, that this suboptimal trajectory in the historical transformation of the human computer symbiosis was a likely outcome of the unique technical and cultural conditions under which the network age arose, felt by a number of theorists writing in other areas, represented by Horkheimer and Adorno, Derrida, Turkle. Second, that its aysmmetrical track can be realigned to resume mutual, synergetic capability expansion extolled by early theorists such as Licklider, Engelbart, and Kemeny by giving programming a second look in digital humanities scholarship.[45] Third, that a new discipline of critical programming emerges as a means of philosophical engagement that foregrounds working code. My approach is guided by philosophical insights that promote the constructive co-evolution of humans and machines, by paying attention to the nuances of their many levels of interaction, and also that call for building as well as interpreting these interfaces that we acknowledge are co-constitutive of our posthuman, cyborg identities. It extends the first two sets of perspectives with the suggestions of subdisciplines that have emerged in the last decade: software studies, critical code studies, and platform studies.

Not to Use Old Tools for New Problems

According to Ian Thomson's reading of Heidegger, America is the avant-garde of *ontohistorical technologization*, that is, our nation is the one working the hardest to obscure the insight that we humans are *not* entities making ourselves, in an odd reversal of the Socratic imperative to know thyself (155). Philosophers of technology in the hermeneutic, phenomenological tradition that follows Heidegger often see their task as curing this delusion. Yet Heidegger himself has been criticized for the apparent indifference that is a consequence of conceiving the essence of freedom at such a high level. David Michael Levin, introducing the chapter “Time's Cinders” by Herman Rapaport in *Modernity and the Hegemony of Vision*, discusses Rapaport having been influenced by reading Derrida's *Cinders*, finding that “the indifference of an openness which allows for the possibility that the lighting of being may be turned into the fires of hell, the monstrous evil of the Holocaust. . . . How do the cinders that remain tell of the dead bring being into time and time into being? For Rapaport, this is a relation that can profoundly unsettle our understanding of ourselves and challenge our capacity for vision” (15-16). Similar questions may be posed when encountering the self-assured predictions – and personally-backed corporate missions – of Kurzweil, Gates, and other default philosophers of computing introduced in the previous section. In the progressive editions of Johnson's textbook on computer ethics, she likewise arrives at the realization that emphasizing primarily the new aspects of technologies represents an old way of approaching ethical issues. Hence the third edition emphasizes that the goal building ethics into informed design is not treated seriously by scholars in computer ethics, which continues to present computer and IT ethical questions as new species of generic moral issues, but with the added need to consider the implications of their instrumentation of human action. Her summary deprivileging of the standard account of computer ethics in the fourth edition and introduction of the sociotechnical systems perspective represents the attempt to deploy a new tool.

However, splicing in the perspective of a computer scientist leaves a fundamental methodological gap because her insights do not themselves arise from long time immersion as a practicing theorist.

Mainstream humanities have also been popular targets for failing to adapt their practices. As Jeff Rice reveals in *The Rhetoric of Cool*, composition research has always been wary of using new tools, whether the typewriter or computer display, without prior, in-depth empirical study; meanwhile generations grow up using these tools daily, developing practices that outstrip research (143-144). G. Thomas Tanselle, in the foreword to *Electronic Textual Editing*, argues the computer as tool does not fundamentally alter reading or subjectivity (3), whereas Manovich, Hayles and others strongly disagree. The dismissive perspective seems to not consider digitally native electronic texts, only electronic versions of texts originally composed with prior media forms. Hayles makes her famous statement of postmodern orthodoxy that body is primarily linguistic and discursively formed. “One contemporary belief likely to stupefy future generations is the postmodern orthodoxy that the body is primarily, if not entirely, a linguistic and discursive construction. Coincident with cybernetic developments that stripped information of its body were discursive analyses within the humanities, especially the archeology of knowledge pioneered by Michel Foucault, that saw the body as a play of discourse systems” (*How We Became Posthuman* 192).[46] Manuel Castells recognized the formation of the “culture of real virtuality, in which the digitized networks of multimodal communication have become so inclusive of all cultural expressions and personal experiences that they have made virtuality a fundamental dimension of our reality” (xxx-xxxi). The intermingling of discourse systems and dynamic mechanisms of real virtuality force traditional, print-oriented humanities out of this obsession with discourse rooted solely in natural languages. The struggle is evident in Derrida's *Archive Fever*, when he repeatedly asks whether it makes any difference that Freud did not have email when he developed his psychological theories. Does it change anything that Derrida did not write software,

remembering he is shaping the main text around his own wonderment at himself subtitling his future work a Freudian impression when put on the spot in a telephone call to come up with a title? What if humanities theorists had been writing software and tinkering with code along with pouring through ancient texts?

Whether it is blindness to the cinders, on the side of technologists, or blindness to the circuits, on the side of humanists, there is room for a more nuanced critical stance. Not to use old tools to solve new problems is the flip side of Seneca's *ponenda non sumeret*; it resists defaulting to intellectual practices that, while successful in the past addressing for the technological apparatus of literacy, flail when applied to the apparatus of modern electronic computing and other contemporary forms of instrumentation.[47] We are granted insight into that other great question Heidegger asked for us, what handicraft modern man in the technological world must carry on, must carry on even if he is not a worker in the sense of the worker at the machine. "Modern science's way of representing pursues and entraps nature as a calculable coherence of forces. Modern physics is not experimental physics because it applies apparatus to the questioning of nature. Rather the reverse is true. Because physics, indeed already as pure theory, sets nature up to exhibit itself as a coherence of forces calculable in advance, it therefore orders its experiments precisely for the purpose of asking whether and how nature reports itself when set up in this way" (“QCT” 21). We respond through digital humanities research to the Socratic search for that kernel of subjectivity now shot through by calculative thinking and the encompassing built environment that Andy Clark calls extended mind. Ong does not look deeper to why ancient complaints about writing and modern complaints about computers seem similar, equivocating that "essentially the same objections commonly urged today against computers were urged by Plato in the *Phaedrus* (274-7) and in the *Seventh Letter* against writing. . . . [It is] inhuman . . . destroys memory . . . Calculators weaken the mind, relieve it of the work that keeps it strong. . .

unresponsive . . . 'Garbage in, garbage out' . . . cannot defend itself . . . . Those who are disturbed by Plato's misgivings about writing will be even more disturbed to find that print created similar misgivings when it was first introduced" (78-79). Is there a loss in philosophical space resulting from rejection of computer languages?[48] Even Deleuze and Guattari, whose anti-establishment, rhizomatic, bricoleur meanderings seem to play into the bazaar development model championed by free, open source advocates, appear to dismiss the need for empirical verifications of philosophical concepts. "Science needs only propositions or functions, whereas philosophy, for its part, does not need to invoke a lived that would give only a ghostly and extrinsic life to secondary, bloodless concepts. The philosophical concept does not refer to the lived, by way of compensation, but consists, through its own creation, in setting up an event that surveys the whole of the lived no less than every state of affairs" (*What is Philosophy?* 33-34) Philosophical concepts set up events that are not confirmatory but totalizing in their interpretation, yet how does this statement cohere with the awkwardness of illustrating postmodern concepts in their works and by others, when in contrast Turkle has already declared the Macintosh to be the quintessential postmodern object? In his manifesto for new tools and practices for humanities scholarship, *E-Crit*, Marcel O'Gorman describes the failure of theory by investigating “how attempts to apply deconstruction toward the materialization of revolutionary scholarly practices have been largely ineffectual. . . somewhere in the early 1990s, the major tenets of deconstruction (death of the Author, intertextuality, etc.) were displaced into technology, that is, hypertext. Or to put it another way, philosophy was transformed, liquidated even, into the materiality of new media. This alchemical transformation did not result in the creation of new, experimental scholarly methods that mobilize deconstruction via technology, but in an academic fever for digital archiving and accelerated hermeneutics, both of which replicate, and render more efficient, traditional scholarly practices that belong to the print apparatus” (xv).

I will appeal once again to David Rushkoff's analogy between the computer industry and the automobile industry. While we may exercise degrees of freedom by driving around on the roads in automobiles whose mechanical operation we do not need to comprehend, our ignorance of the political and social histories behind the roadway infrastructure forces us into a reactionary relationship to suburban sprawl, traffic congestion, Big Oil, the insurance industry, pollution, and so on. Likewise, Deborah Johnson's self-acknowledged lack of a rich technical backstory for the first three editions of *Computer Ethics* led to the methodological approach of casting new problems into old philosophical models. Thus, the third edition, after adding content on virtue ethics and Rawls' theory of justice, still resolves the ethical question of copying proprietary software that it is immoral simply because it is illegal, swallowing whole the Western property rights tradition. However, the questions that have inflamed debate over the advantages of free, open source software, and comparative, scholarly study of software development practices do not make it into the computer ethics syllabus. In any event, we need to study technology to respond to classical philosophical questions. Indeed, Michael Heim interpellated them by calling the word processor the calculator of the humanist (*Electric Language* 1). Yet the metaphor has already been distorted because word processing operations not only go far beyond arithmetic manipulations, but also, through progressively more user friendly interfaces, human operators no longer follow the procedural rhetoric connecting input to output. Now is the time to study the transition we are caught up in, and this prompts digital humanities solutions, large scale, collective, free, open source, always available, always ready at hand, in all their revisions, to foster new ways to think, act, and speak. Turkle and O'Gorman sensed this transition as they noted the failure in application of postmodern methodologies to find meaningful objects to study, and discovered in electronic media their quintessential expression. Moreover, addressing these new problems must acknowledge, following Manovich, the three modes of learning and doing now embodied in human-computer interfaces, and not merely decry the lack of programming skill in recent generations on

account of laziness, consumption economics, or closed-source hegemonies.

Scholarship Requires a Cybersage

In a curious twist near the conclusion of *The Dumbest Generation*, the author blames the culture war instigated by the 1960s New Left for initiating the overall decline of intellectual life by rejecting reading and learning obsolete and irrelevant topics (226). This accusation relates to a dilemma I find at the heart of the philosophy of computing: one the one hand, to understand technology, one must learn to use it, yet the state of the art is so complex that it is unmanageable for novices; on the other hand, beginning with simpler, older technologies as Brin recommends is a non-starter for those who adhere to the *ponenda non sumeret* tenet, to not waste one's time dabbling in obsolete, useless topics. The unfortunate outcome is that ignorance of technical details shunts formation of places for philosophical thought to occur, such as in the working code of critical programming studies. “Contact with the past steadies and composes judgment of the present,” harps Bauerlein, adding that “people who read Thucydides and Caesar on war, and Seneca and Ovid on love, are less inclined to construe passing fads as durable outlooks, to fall into the maelstrom of celebrity, pop culture, to presume that the circumstances of their own life are worth a Web page” (191). Though we need a critical filter to escape the confines of mores derived from popular culture, and could develop it by reading the classics, the problems posed by new technologies deserve more than the cursory dismissal that Seneca performs. As a historical note and delicious detail missed by Bauerlein, Seneca himself was railed upon by his own contemporary critics, including Quintillian, who complained that the former was in the hands of all the youth – like web media today – but infused a depravity of style through his manner of writing.[49] The critical stance we need now is not that of another Quintillian or Bauerlein, but rather a *cybersage*.

When Richard Johnson laid out his methodological discipline in “What is Cultural Studies

Anyway?" he remarked that text-based studies of major humanities disciplines seem to have meager ambitions. "Looking at it from outside, the situation in the humanities and especially in literature seems to me very paradoxical: on the one hand, the development of immensely powerful tools of analysis and description, on the other hand, rather meager ambitions in terms of applications and objects of analysis. . . . Forms, regularities and conventions first identified in literature (or certain kinds of music or visual art) often turn out to have a much wider social currency. As usual, then, the problem is to appropriate methods that are often locked into narrow disciplinary channels and use their real insights more widely, freely" (59). Text may become associated with qualities of the computer rather than print, Jay David Bolter argues in *Writing Space* (3); however, what goes in the parenthesis differentiating computer from text must become the subject of critical study. Philosophers of computing are likewise tasked with uncovering how potentials squandered as everyday programming declined as the personal computer matured, in parallel with the decline in casual reading spawning the dumbest generation, or never got going in the first place. Michael Heim makes what I call the cybersage declaration for addressing the metaphysical sphinx of computer technology epitomizing the all-enframing Gestell: "Heidegger the thinker is Heidegger the scholar; and the scholar searches ancient texts for clues about the history of Being. . . . This image of Heidegger feeds on nostalgia. . . . The Schreibstübe is giving way to the computer workstation, and scholarship requires a cybersage" ("Computer as Component" 304-305). Yet in *Electric Language*, before he became obsessed with virtual reality, Heim implies that reducing the Socratic question to a computational metaphor is often the only way to consider our interaction with tools. "It is tempting to regard the question about the influence of word processing on our thinking as continuous with the question about the way the computer – understood vaguely as a general automated intelligence affects human self-awareness. Such an approach examines the way humans come to perceive their own thought processes when exposed to continuous interaction with automated intelligence. After all, much of our thinking about internal matters we find generally obscure is aided

by metaphors, pictures, and ideas drawn from our interaction with tools” (27).

John von Neumann, hands-on cybersage of early electronic computing, made an outrageous statement – at least for humanists – that will haunt cybernetics and the humanities philosophy of technology for the following decades, suggesting the Socratic command “know thyself” ought to be addressed through studying technology. "Of all automata of high complexity, computing machines are the ones which we have the best chance of understanding. In the case of computing machines the complications can be very high, and yet they pertain to an object which is primarily mathematical and which we understand better than we understand most natural objects" (“Complicated Automata” 435). We sense a revised perspective for the relation of human subjectivity to the environment, shifting a portion of the active, cognitive burden to the distributed symbiosis. Further back in the prehistory of modern computing, Nietzsche was the cybersage prototype, philosophizing with one of the first typewriters, and later (after it broke down) about the typewriter, writing that “our writing tools are also working on our thoughts,” cleverly interpreted by Kittler. “Hence Nietzsche's next thought four years after the malfunctioning of his typewriter was to philosophize on the typewriter itself. Instead of testing Remington's competing model, he elevated Malling Hansen's invention to the status of a philosophy. And this philosophy, instead of deriving the evolution of the human being from Hegel's spirit (in between the lines of books) or Marx's labor (in between the differential potential of muscular energy), began with an information machine" (208).[50]

There are long historical streams connecting the logos of Heraclitus to logic systems in electronic circuits; this is a task for going toward a philosophy of computing. To date there has been little serious academic philosophical or practical appraisal of emergence of technological unconsciousness of machine-readable and coded objects for everyday life (Kitchin and Dodge 61). To notice any of this entails appreciating the importance of 'moments of plasticity' through social

organization resulting in crystalization of particular techniques and technologies, well described by Jonathan Sterne in *Audible Past*. “These moments of plasticity, where the social organization of sound can and does change, are perhaps the defining characteristic of the modern sound media. . . . For a history of sound, however, it is precisely the moments prior to this crystallization that are most interesting it is the mutability as opposed to the eventuality of form that is at stake" (182).[51] Sterne is astute at demonstrating how to adequately historicize technological change as narrative, a form reminiscent of older technologies from previous years, decades, centuries, even millennia. “To use Lukac's language, social relations take on a phantom objectivity; over time, they become associated with technology itself in the minds and practices of users. This is readily apparent today, to offer an oversimplified illustration: casual users associate sound recording with music and entertainment, radio with broadcasting, and telephony with point-to-point communication” (182).[52] Heim notes in the preface to the second edition of *Electric Language* in1987 that philosophy was just beginning to consider implications of writing and using hypertext, hypermedia and virtual worlds; he predicts the coming importance of visual features, active visual literacy superseding television and video, and the challenges of three-dimensional environments displaying text. How we compute shapes how we think, echoing Nietzsche, Kittler.[53] As Bruno Latour argues in *We Have Never Been Modern*, “the itinerary of facts becomes as easy to follow as that of railways or telephones, thanks to the materialization of the spirit that thinking machines and computers allow. When information is measured by bytes and bauds, when one subscribes to a data bank, when one can plug into (or unplug from) a network of distributed intelligence, it is harder to go on picturing universal thought as a spirit hovering over the waters (Levy, 1990). Reason today has more in common with a cable television network than with Platonic ideas” (119). There is value in studying technology, especially thinking machines, to better understand epistemology thanks to this materialization of spirit.

Henry Jenkins insists cultural producers need media literacy education; “we need to rethink the goals of media education so that young people can come to think of themselves as cultural producers and participants and not simply as consumers, critical or otherwise” (270). Rushkoff likewise wants us to sense that the return to understanding programming puts humans back in control of steering civilization, now understood fitting better with *WALL-E* imagery than driving off a cliff (11).[54] Conley puts it bluntly. "Evidence shows that technologies have not led humans toward any promised land. . . . In view of the grim prospect of the twenty-first century, we are compelled to ask how critics of culture, philosophers, and artists will deal with technologies. . . . Now, in a world where the notion of space has been completely changed through electronic simultaneity, where the computer appears to go faster than the human brain, or where virtual reality replaces reality, how do philosophy, critical theory or artistic practices deal with those shifts?" (xii). Tempered by admission of foss hopes, we should follow Deborah Johnson performing critiques of arguments that Internet is a democratic technology, paying attention to emerging issues of jurisdiction, systems of trust, and insularity. Deleuze writes what has become a popular metaphor for post-postmodern technologies studies, “it's up to them [young people] to discover what they're being made to serve, just as their elders discovered, not without difficulty, the telos of the disciplines. The coils of a serpent are even more complex than the burrows of a molehill” (7). At the same time, we must, if we do not ourselves, encourages others, especially youth, to do more – or is the mistake here to include the young who have not passed through the cleansing process of digital imigrancy?[55]

A constant refrain by Gates and other technology evangelists is that “the Internet is the greatest self-publishing vehicle ever. Its bulletin boards have demonstrated some of the changes that will occur when everyone has access to low-friction distribution and individuals can post messages, images, or software of their own creation. . . . Almost any topic you can name has a group communicating about it

on the network" (123-125). While Bauerlein argues the lowered friction of distribution by Internet has dampened tradition and allowed closed circuit of self-selected media consumption cycles dominated by low word count social messages, the final critical assessment by this default philosopher of computing is that the information highway will provide choices for connecting people with entertainment, information, and each other: a benign, helpful presence rather than a potential threat to governmental abuse or worse as feared by Black, Winner, and Postman. Predictions by Gates about transformations faster PCs and the information highway may bring are literally queuing up the projective city of the new spirit of capitalism articulated by Boltanski and Chiapello, which becomes a key topic of the next chapter. His advice is to become informed, sidestepping issue of participatory involvement or outright rebellion. Gates believes the mere availability of information will spark curiosity, whereas Bauerlein argues that unguided and uninformed by tradition, children are lured into limited peer interests. Turkle, back in 1984, notes the problem of the novelty wearing off to the point that culturally poignant observations about computers disappear into the background like their disappearing interfaces; "our culture will develop ways of thinking about the computer that, in a sense, require no thought" (*Second Self* 331). The concealment of being in the non-thinking comportment to technology foreshadowed here repeats the ontotheological threat that kept Heidegger in his mountain hut and perpetuated the antiquated image of the thinker. The cybersage scholar I am theorizing here does not turn away, but instead engages in digital humanities projects that meet the danger head on.

Digital Humanities Projects

A key feature of academic scholarship falling under the general term *digital humanities*, besides leaning heavily on technological components in its methodologies, is adherence to rigor and systematic, unambiguous procedural knowledge characteristic of the sciences, applied to humanities problems previously treated serendipitously through narratives and literary associations (Hockey 3). In

a sometime critical, reflexive fashion, the scope of humanities questioning has grown to include the very software development and data collection techniques employed as its tools. A periodization perspective of humanities computing begins in 1949 and extends to early the 1970s with the signal work of Father Roberto Busa. A Jesuit priest, Busa envisioned a monumental project for indexing the words of St. Thomas Aquinas in a mechanically searchable concordance. His prayers were answered by Thomas Watson, Sr. and IBM, which provided machinery and expertise for transferring the texts to punched cards and writing a concordance program. Thus the first humanities computing software project was developed to parse and lemmatize medieval Latin, the *Index Thomisticus*, headed by Busa through 2005 and going through numerous hardware and software generations.[56] While textual studies employing quantitative analysis have been done in the past, the sorting, indexing, and counting capabilities of high speed machinery afford new possibilities, new places, I will argue throughout the dissertation, to do philosophy in conjunction with highly engineered solutions. In what seems like an embodiment of the living writing to which Socrates alludes in the conclusion of Plato's *Phaedrus*, Busa theorizes a more ambitious project, the *Lessico Tomistico Biculturale*, of which he insists that “only a computer census of the syntactic correlations can document what concepts the author wanted to express with that word. Of a list of syntactic correlations, the 'conceptual' translation can thus be given in modern languages. . . . To give one example, in the mind of St Thomas *ratio seminalis* meant then what today we call genetic programme. Obviously, St Thomas did not know of either DNA or genes, because at the time microscopes did not exist, but he had well understood that something had to perform their functions” (xvii-xviii).[57]

As the default philosopher of computing for the sake of also being the founding digital humanist, Busa defines and sets the agenda for the new discipline of humanities computing, now digital humanities. He identifies three perspectives he experienced over sixty years in the field. The

miniaturization perspective, during the early years, foregrounds the transition from inefficient paper punched cards to the new technologies offering multiple orders of magnitude improvement or size, for “in His mercy, around 1955, God led men to invent magnetic tapes” (xvii). Following this first perspective of technological miniaturization, making gadgets, the second of textual informatics itself has three branches: documentaristic, which includes media production; editorial, from what critical editions arise in media production; finally, hermeneutic, where the engagement of philosophical questions via engineered solutions is most apparent.[58] Busa names first current of textual informatics documentaristic, calling *computing centers* the phenomena I refer to as collective intelligence. To him, editorial humanities computing has submerged into standard word processor software, although it also includes scholarly editions and online archives. He rightfully claims his computing project an intentional act establishing hermeneutic informatics, and links it to the guiding corporate hand of IBM through Watson providing a highly engineered solution. Textual hermeneutics are summarized descriptively by three periods, beginning with the *Index Thomisticus* project to fragmentation coincident with the Alpac Report. Busa envisions a third, global, collaborative universal language programming anti-Babel project, if we can collective reassemble the spirit dispersed among vested interests. Not shy of giving a project description in geek speak of his time, this cybersage lays it out thus: “Schematically, this implies that, with integral censuses of a great mass of natural texts in every language, in synchrony with the discovered data, methods of observation used in the natural sciences should be applied with the apparatus of the exact and statistical sciences, so as to extract categories and types and, thus, to organize texts in a general lexicological system, each and all with their probability index, whether great or small" (xviii). Busa answers to Kittler's call for focus on specifying the schematism of perceptibility describing their programming design.[59] He notes the launch of the magazine *Mechanical Translation* by MIT promoting wider dissemination of this direction in textual hermenutics after it got the attention of biopower.[60] Ironically, the Alpac Report canceled machine

translation funding not for technological, as in hardware limitations, but ontological deficits foreshadowing object oriented design principles. Its scope was unimaginable to software engineering practices in the age of assembler, dooming these early efforts as premature. Yet Busa notes the shortcomings of philology as a strong foundation for humanities computing, rather than software design, to me implying emphasis on the 'traces' of the electracy of his time, lacking tools for adequately posing ways to pursue new problems.[61]

Busa's contributions are memorable for invoking the Delphic imperative 'know thyself' in a call for comprehensive global, collective cognition heavily afforded by directed informatics, Engelbart's Type C activity that improves improvement, rather than unanalyzed use using old tools or suboptimally using current ones.[62] But in the end Busa himself symbolizes the first digital humanities period that Hockey presents, long before personal computers and the Internet. Hence the initial scope of humanities computing is summarized as applications to research and teaching within humanities arts subjects, with a bias for textual sources. As prior humanities computing work by Mosteller and Wallace on the authorship of disputed Federalist Papers had interested in statistical methods, demonstrating consciousness of purposes as well as reflection on expansion of techniques becomes part of the philosophical contemplation of computing technologies (Hockey 5). Data input, storage, and representation are recognized as key technological limitations.[63] For example, the serial processing limitation of magnetic tape affected encoding of historical material, forcing it into single linear streams. The second major period in digital humanities worked key problems focusing on textual material, the symbolic, inherited form those early periods, with a preponderance of vocabulary studies leveraging concordance programs. COCOA concordance program provided markup, and yielded economical file space usage.[64] Disk storage and relational technologies still created problems in forcing information into tables. Hockey notes widening range of interests at conferences and consolidation of common

software platforms like Oxford Concordance Program noted during second period from the 1970s to mid 1980s. The Oxford Text Archive initiative strove to avoid duplication of effort in text archiving and maintenance; text preparation, rather than programming, began to take the majority of project time. Theodore Brunner's *Thesaurus Linguae Graecae* (TLG) project, on the other hand, focused on creating a new research archive versus preserving individual projects by others in commodity informational substrates. Hockey notes that the *Computers and Humanities* journal started publication in 1966, and prototype ALLC/ACH conferences began around 1970. Thus dissemination through conferences and journals are marked as the other primary feature of the second period of humanities computing. Yet these are all characteristic collective intelligence residing in computing centers whose limiting factor at individual scope is the very wealthy experimenters like Bill Gates with his house.

Next the personal computer period of mid 1980s to early 1990s freed humanities computing from the computing centers, their expertise and scrutiny. The result was much duplication of effort, but also innovation, which I find comparable to the cathedral versus bazaar models of software development popular in foss discourse networks. It is here that we meet again the quintessential postmodern object, for digital humanists found the Macintosh attractive for the ability afforded by its GUI to display non standard character sets and, as a second important reason, build hypertexts via its Hypercard programming tool. Hockey suggests Hypercard was the first simple programming tool available to individual humanities scholars for their personal cybersage workstations, having noted prior debates over the utility of the same individuals whose primary occupation is to study texts spending time coding in the first place. What was more important was its ability to “build some primitive hypertexts easily” to usher in an age of digital archive discourse networks reflecting on navigation. At the same time electronic mail shared at 1985 conferences led a new era of immediate communication, exemplified by the Humanist ListServ since 1987. *Humanist* became the model

electronic discussion list, credited for developing and maintaining via distributed scholarly communities defining humanities computing. Development of TEI from SGML is typically argued the major intellectual development of third period, inspired by a 1987 conference meeting at Vassar to ponder possible standard encoding schemes for near future computing platforms now personal computers connected to the Internet. The Text Encoding Initiative (TEI) reflects interest in markup in addition to providing a usable, systematic attempt to categorize and define all features of humanities texts of interest to scholars, yielding over 400 tags. As email and web use exponentially increased, the fourth period combines the personal computer and the nascent networking via TCP/IP enjoyed by users in established computing centers since the third period. Hockey and others note that the impact of the Web initially missed by entrenched humanities computing practitioners, just as Microsoft did. And it was good for programming again, though as HTML, XML, and other markup languages like the fantastic fantasy unknown SGML, the procedural focus of C so evident in high speed digital process control systems may have been lost. Among other debates, TEI adherents criticized HTML as a weak, appearance based markup system like word processor formats, rather than exploring the possibilities of TEI and HTML together.[65] Ironically, it happened anyway, as delivery of scholarly material over Internet became new focus. As the fourth periods continues, libraries and corporations are new players in putting collections on the Internet along with digital humanities projects. However, as Hockey notes, the unpredictability of TEI extensibility clashes with needs of libraries for durable, closely followed standards, raising questions about the overall philosophy of TEI that was also invoked to prove its superiority to HTML.[66]

Hitherto, in the brief history of digital humanities projects, textuality has reigned. Not only text-based scholarship, but traditional archival and editing projects dominate the field over these first four epochs.[67] The addition of multimedia added new dimensions to humanities electronic resources, but

their contents were mostly limited to manuscript images, awaiting ubiquitous high speed access, perhaps through convergence with television. Today digital archives include other static visual content; examples featuring audio and motion video are only beginning to emerge, well documented in the work of N. Katherine Hayles in *Writing Machines*, *Electronic Literature*, and *How We Think*. Certainly new collaborative projects are made possible by Internet technologies; however, the importance of their project management aspects have been largely underappreciated. As media theorists began studying electronic resources themselves, especially hypertext, a noticeable gap between sayers and doers among them as formed. These are not theorist-practitioners like Busa; as Hockey explains, “electronic resources became objects of study in themselves and were subjected to analysis by a new group of scholars, some of whom had little experience of the technical aspects of the resources. Hypertext in particular attracted a good many theorists. This helped to broaden the range of interest in, and discussion about, humanities computing but it also perhaps contributed to misapprehensions about what is actually involved in building and using such a resource. Problems with the two cultures emerged again, with one that was actually doing it and another that preferred talking about doing it” (16).

Nonetheless, Hockey hopes humanities computing can grow interest in cultural heritage among lifelong learners and general public, which Bauerlein should also praise. Philosopher of technology Andrew Feenberg theorizes that technical devices and programs must be informed by collective choices about the good life, or they have no reason to be conceived, forming his trademark concept democratic rationalization, often associated with free, open source software for reflecting similar social divisions at the level of technological artifacts within extant systems. "Thus pure moral norms are insufficient to define a society; they must be concretized through choices about the good life. (180) Pure technical principles do not define actual technologies" (*Questioning Technology* 180).[68] Foss emerges as quintessential of the next great media period. Busa, even from a privileged position, fantasizes openly about the kind of technologically mediated thinking places that can be devised for philosophical

thought, and describes cybersage pursuits extending his Index Thomisticus and LTB software projects animated by ancient texts. Doing so restarts the splintering advance stalled by Alpac report, “if and when comparative global informatics begins in the principle languages” (xxi).[69] While computer technology may be of questionable value to everyday masses – the losers, as Postman calls them – it is from the losers that revolutionaries often emerge, especially when equipped with longitudinal historical perspectives gained from liberal studies, especially the classics. Rushkoff calls for human response to technologies, a new ethical template, akin to the codification by the Torah and Talmud of changes brought on by literacy (25). Classicists are ideally positioned to inform texts and technology theories. Consider Greg Crane's future prospects having spent years developing software that displayed Greek before GUIs and distributed networking: “these include not only virtual reality displays and geographic information systems but also automatically generated timelines and other data visualization techniques” (53). Visualizations, language technologies, annotation managers, library repositories, all seek to claim territories for future jobs for digital humanists.[70] Marie-Laure, in "Beyond Myth and Metaphor: Narrative in Digital Media," recommends do-it-yourself (DIY) genres of democratized art such as Ulmerian artifacts; I suggest with the DIY focus blending in technical skill exercises and meditations on machine and posthuman embodiment. Deliver these kinds of digital humanities solutions that involve networks of foss projects: that is the conclusion I will reach after developing an ethical argument supporting taking this active programmer stance toward our cyborg technologies.

As Crane notes, part of the cynicism vexing academics is presupposing a minority participation stance such as by classicists, always in democratic rationalization, not the vanguard, invoking the concept made famous by Andrew Feenberg that requires technological advances be made in opposition to dominant hegemony to be truly free choices. "I call this democratic rationalization because it requires technological advances that can only be made in opposition to the dominant hegemony"

(“Democratic Rationalization” 664). Foss projects become quintessential digital humanities projects as multipurposive, authochthonous, democratic, amateur, distributed network phenomena, encompassing some classicists, giving them meaningful subtasks and commit rights.[71] But the excitement of theorizing about the GPL peaked during its newness phase and has subsided. Perhaps Feenberg answers this question, acknowledging “that the arc of cultural advance has nowhere been prolonged to the point where it generated major technological alternatives, but that possibility casts a shadow over current arrangements and refutes technocratic complacency and resignation” (*Transforming Technology* 155). Thus we are obliged to investigate the social life of knowledge. Today this takes many aspects: textuality and media studies, social construction of technology, software studies, critical code studies, and now critical programming. As Mathew Fuller writes in the introduction to *Software Studies: A Lexicon*, “intelligence arises out of interaction and the interaction of computational and networked digital media with other forms of life conjugate new forms of intelligence and new requirements for intelligence to unfold. As a result, a number of authors collected in this book have called for a renewed understanding of what literacy should mean contemporarily. Among others, Michael Mateas has made an important call for what he describes as Procedural Literacy” (10). Procedural literacy is a key competency developed and exercised through programming. Digital humanities projects do not yet explicitly focus on their programming, the way composition studies and writing about writing have become an established subdiscipline. During the second decade of the twenty-first century a few groups have emerged. “Key to Critical Code Studies will be the development in practitioners of programming literacy,” writes Mark Marino in this group's formative statement (np).

We cannot ignore code, as digital humanists, philosophers of computing, philosophical programmers, and of course not if we are programming philosophers. And we need philosophies of computing. Hayles strongly builds support for these activities in her provocatively titled book from the

heyday of foss hopes in academic writing, *My Mother Was a Computer: Digital Subjects and Literary Texts*. “Strategies can emerge from a deep understanding of code that can be used to resist and subvert hegemonic control by megacoprorations; ideological critiques can explore the implications of code for cultural processes, a project already evident in Matthew Fuller's call, seconded by Matthew Kirschenbaum, for critical code studies; readings of seminal literary texts can explore the implications of code for human though and agency, among other concerns. Code is not the enemy, any more than it is the savior. Rather code is increasingly positioned as language's pervasive partner” (61). Note those with deep understanding of code are computer programmers and engineers, so the very force demanded by the ethical stance arrived through her arguments must arise from that for which it is summoned to oppose, and FOSS facilitates emergence of DIY hobbyists who may also engage this strongly sought understanding in their pursuit and production of democratized art.[72] I prefer to describe such work as responding to the Socratic search for kernels of subjectivity through digital humanities research. We need to study technology to respond to classical philosophical questions and new problems that arise as the bases of humanity continue to transform.

As we need to study the technological milieu in which we exist in order to diagram their schematism of perceptibility, per Kittler, now is the time to study the transition we are caught up in from out of the dumbest generation toward *WALL-E* futures. Heim declared the word processor was the calculator of the humanist, but it has already been revealed that the becoming calculator of first generation digital humanities projects represented a shunting of philosophical questioning away from the act of programming. Crucially, and dissolving all differences within the electronic era, using computers and networks is different than using calculators because we barely know what we are asking them to do, as we manipulate the GUI, and hardly teaching them how to do it, as Kemeny insisted was the right way to combine programming and arithmetic. We do not know that we are arranging computations the way pressing buttons on a calculator must. Rushkoff elegantly describes this absent

mind pursuing its interests. “The way to get on top of all this, of course, would be to have some inkling of how these thinking devices and systems are programmed or even to have some input into the way it is being done, and for what reasons. . . . With computers and networks, unlike our calculators, we don't even know what we are asking our machines to do, much less now they are going to go about doing it. Every Google search is at least for most of us a Hail Mary pass into the datasphere, requesting something from an opaque black box” (23). Understanding biases is the guiding philosophy for getting on top of the problem posed by rapidly transforming technologies that seem to have taken command on their own, and the method to do it I call critical programming.

Critical Programming Studies

Theorists of literature, composition and media studies who align with digital humanities have made many contributions to what could be called philosophies of computing, although I prefer to consider these efforts preparatory while the discipline interpellates itself as such. George P. Landow, whose volume on hypertext is in its third revision, credits Gregory Ulmer with establishing grounding philosophical arguments connecting hypertext theory to Derrida and other poststructuralist and postmodern thinkers. “Gregory Ulmer comments that the use of communications technology is a concretization of certain metaphysical assumptions, consequently that it is by changing these assumptions (for example, our notion of identity) that we will transform our communicational activities (*Applied Grammatology*, 147). We may add that the use of communications technology is also a concretization of certain political assumptions. In particular, hypertext embodies assumptions of the necessity for nonhierarchical, multicentered, open-ended forms of politics and government” (344-345). Yet Landow's blind spot, similar to Deborah Johnson's, surrounds the topics near and dear to technologists who are, in the words of Ellen Ullman, *close to the machine*. When he gives the example of the work of James Boyles to allude to a colonialism among first-world scientific establishments

creating intellectual property from research conducted in Third World countries, which “demonstrates how laws supposedly intended to promote innovation by rewarding creators recognize only creativity and originality based on romantic authorship,” (368) there is no mention of free, open source software licenses or creative commons copyrights, though they would fit the discussion well as an additional perspective that has permeated mainstream technology circles. His discussion of early experiments in electronic literature utilizing the Storyspace platform, whose webs “permit one-to-many links, link menus, and path names all provide authors with the power to empower the reader" (222), retain emphasis on the reader experience. N. Katherine Hayles, on the other hand, imbues the maker perspective in her discussion of humanities research. “If we think about humanities research and teaching as problems in design (i.e., moving from content orientation to problem orientation), then [Fred] Brooks's advice suggests that for collaborative teams working together to craft projects and curricula in digital media, it is crucial for them partners to recognize the importance of human attention as a limiting/enabling factor, both as a design strategy and as a conceptual framework for theoretical work" (*How We Think* 11). Yet Hayles herself, who has done much to spearhead collaborative, Big Humanities projects, remains on the side of the sayers rather than the doers. I, coming from the technology ranks, will present the programming perspective to complement Comparative Media Studies, and at the same time imagine a different trajectory of the unrealized potential in Landow, Turkle, and others, if there had been a generation of foss-equipped programmers instead of the dumbest one.

According to Wendy Chun, philosophy is just beginning to note effects of software as thing on metaphysics, intellectual property, subjectivity, and information (*Programmed Visions* 5-6). Ulmer gave digital humanities the term 'electracy' to name the period following orality and literacy. Ever since, however, critical theory has foregrounded the *tracy* rather than the *electra*. The distinction I wish to

make foregrounds computer programming where traditional digital humanities theorists continue to emphasize the traces, albeit now shimmering signifiers, passing through Derrida and other popular postmodern theorists discourse networks. It is to acknowledge that the Big Other constituting collective human machine intelligence has a mind of its own, and we are obliged, as philosophers of computing, to seek to understand it.[73] Nigel Thrift employs Patricia Clough's term *technological unconscious* as the pre-personal substrate of conventions of address, the bending of bodies that underlies cognition, perception and movement. Infrastructure must be performative to become reliably repetitive; once it has, it takes on an active if little noticed role in structuring human experience. Under electracy, hypercoordination is leading to new forms of cultural encounter based on what Thrift calls *planful opportunism*. RFID in particular is ushering in continuous information ethology where objects react creatively to the situation. “There seems every reason to believe that they will reshape the practical conduct of life in a way that the bar code has only partly achieved. . . . the possibilities are being worked out at this very moment but the clear intent is to make objects that are able to react creatively to the situation they find themselves in by reading all the other RFIDs broadcasting in their immediate area. As a result, a kind of continuous informational ethology is coming into being” (“Remembering Technological Unconscious” 185).[74] The fourth book in the Software Studies series, *Code/Space: Software and Everyday Life* by Rob Kitchin and Martin Dodge, investigates how software generates new kinds of space and invests the mundane with new capacities of control and surveillance, “showing how software expands out of the computer, becoming spatially active. In doing so software generates behaviors and opportunities, and traffics in meanings, readings, and interpretations” (vii). They note that “interestingly, given the increasing power and role of software, resistance to digital technologies has been remarkably mute despite widespread cynicism over the perceived negative effects of computerization" (20). Crucially, their subsequent list of reasons for why there has been little resistance to digital technologies does not include lack of general programming knowledge, making a huge

opening for performing philosophical investigations of this condition through critical programming studies. As if in response to the findings of Kitchin and Dodge, David Rushkoff offers ten commands for the digital age to balance recognized biases of digital media, of which the most important is to program – or be programmed. His position is that everyone must learn to contend with biases of digital technologies, even if we do not learn to program: “understanding programming either as a real programmer or even, as I'm suggesting, as more of a critical thinker is the only way to truly know what's going on in a digital environment, and to make willful choices about the roles we play" (8). The cognitive competencies described by Ian Bogost, Nick Montfort, Michael Mateas, and others as procedural rhetoric and procedural literacy employ programming as a paradigmatic practice for coming to understand how complex systems operate through the distributed coordination of interconnected levels or layers acting together, which I call *diachrony in synchrony* and will develop as a key component of my critical methodology in chapter three.

To make the transition from using software in digital humanities research to its *critical* use is to make the software development life cycle an integral part of the iterative, dialectical process of thinking through humanities questions. Luc Boltanksi and Eve Chiapello, authors of the monumental work *The New Spirit of Capitalism*, acknowledge the roles played by the Prospero@ software application, its inventors, and the human preparation of management texts into data files so they could be processed by the software (xxix). Yet they do not ponder the influence of this effort on the development of their research. Jerome McGann, on the contrary, views creating software solutions to pursue humanities scholarship with incessant reflection on their design processes, what he calls “poiesis-as-theory” (83). Whereas first generation digital humanists like Father Busa let their predefined philosophical vision guide their development and use of computing technologies, McGann belongs to the self-reflexive cybersage generation. “As it emerges around us, it exposes our need for

critical tools of the same material and formal order that can execute our other permanent scholarly function: to imagine what we don't know in a disciplined and deliberated fashion. How can digital tools be made into prosthetic extensions of that demand for critical reflection? . . . The next generation of literary and aesthetic theorists who will most matter are people who will be at least as involved with *making* things as with writing texts" (18-19). In their 2009 *Rhetorical Nature of XML: Constructing Knowledge in Networked Environments*, J. D. Applen and Rudy McDaniel, by providing a detailed introduction to XML resembling a tutorial, mark the push for humanities scholarship towards technical competence, beginning with differentiation between HTML and XML. I feel that humanists and philosophers are well positioned to make the leap into theorist-practitioner roles, undertaking critical programming studies forming not just disjointed projects but digital humanities solutions.

The next two chapters of this dissertation will bridge the gap between the as-is situation – the legacy of the dumbest generation – and the projective trajectory suggested by McGann, Hayles, Applen and McDaniel, and others who promote a new tools, theorist-practitioner paradigm deeply mixed with critical reflection upon the use and development of those tools. Chapters four and five will seek to advance digital humanities scholarship toward a philosophy of computing, by territorializing the little explored discourse networks of the philosophical programmers who are credited with developing the machinery, languages, network protocols, operating systems, and applications of the post literacy epoch, with the aim of changing the trajectory of the dumbest generation that has formed in its wake, by promoting foss projects that conduct critical programming studies, whose practitioners could be called programming philosophers. Let me say it again: Ulmer gave us the term electracy to name the period following orality and literacy. Ever since, however, critical theory has foregrounded the *tracy* rather than the *electra*. The command issued by Latour not to use old tools for new problems welcomes computer programming components into academic discourse networks through digital humanities

projects. Forming the synthesis portion of this dissertation in chapter five, I will offer my foss triad symposia, tapoc, pmrek as examples of critical programming studies that parallel orality, literacy, and electracy.

The symposia project arose from my earlier studies in ancient Greek philosophy, inspired by imagining Plato's *Symposium* as the transcription of a home video recording of an actual event. For centuries, philosophers have been reading this text rather than listening to it. What happens if the material is presented via text to speech synthesis? The ensoniment of Plato's *Symposium* begins as a free, open source software project hosted on Sourceforge.net called symposia, written in C utilizing the MySQL database engine and *espeak* formant synthesis software project. Jonathan Sterne introduces the term 'ensoniment' in *The Audible Past* for the organization of sound, as 'enlightenment' is for the scientific organization of primarily visual phenomena. The symposia project plays on this theorization by presenting in audible form what has hitherto existed solely as text, what was rhetorically presented by Plato as if it were oral media. Concurrent text to speech processes pronounce the Socratic dialogue as if it was spoken by ten speakers arranged as in the implied virtual setting of the story. Venturing beyond the typical subvocalized expectations of consumers of alphabetic, visual characters in written texts, the potential sonic environments this software sound system might produce challenge ocularcentric conceptions of human subjectivity, and invite rethinking posthuman, cybernetic, program-using and program-writing identity. The tapoc (Toward A Philosophy Of Comptuign) project is literally the computational basis of this dissertation document itself, an amalgam of C++, Perl, PHP and shell scripts interacting with the Apache webserver and MySQL database, iteratively developed over a decade, used to organize thousands of reading notes and personal journal reflections into the chapters, headings, and subheadings you are reading now. Thus it takes literacy to its limit as a combination of human and machine collaboration. Finally, the Pinball Machine Reverse Engineering Kit (pmrek) explores the boundary between human and machine cognition and embodiment by providing an

experimental platform for building electronic circuits and writing computer code to control high speed, digital process control systems, by substituting the microprocessor unit assembly used in tens of thousands of Bally and Stern pinball machines manufactured from the late 1970s through mid 1980s. In each project, acts of working code reflexively inform contemplation of philosophical subjects while concurrently developing practical skills in software development and electronic engineering.

Plan of the Dissertation

The overall trajectory of the dissertation lays out the problem in the first chapter that under digital technologies humans have begun to get dumber while machines continue improving, and articulates this situation as the post-postmodern cyborg network dividual in the second chapter by looking at the relationships between subjectivity, technology, cybernetics, embodiment and techno-capitalist networks constituting human machine symbiotic being. The third chapter develops a theoretical framework and methodology combining critical theory, textuality and media studies with the social construction of technology, applied to histories of computers, networking, and software. This background sets the stage for review of the related disciplines of software studies, game studies, moving to critical code studies arriving at a critical framework for revisiting cyborg identity deeply intertwining human and machine practices and concerns. The fourth chapter then applies the framework to a study of philosophical programmers, examining the work and writings of pioneers of computers, programming languages, networking protocols, and operating systems, and application developers. It also examines ethnographic studies of programming practices and research in learning programming. The final two chapters synthetically develop the notion of critical programming as a digital humanities discipline aimed at mitigating the problems of the cyborg dividual by suggesting an approach towards a philosophy of computing. Chapter five explores how philosophy happens in such working code places articulated in the previous chapters, foregrounding the work of a number of

contemporary programming philosophers before delving into three software projects that I have been developing for the past decades as sites for expanding my philosophical horizons in the context of my professional work as a professional software engineer and the UCF texts and technology doctoral program. Finally, chapter six responds to the problems posed at the outset and offers recommendations for further study, offering numerous current and future digital humanities studies and solutions.

Chapter/Activity	**Target Completion**	**Semester**
1	September 30, 2014	Fall 2014
2	November 30, 2014	Fall 2014
3	January 31, 2015	Spring 2015
4	March 31, 2015	Spring 2015
5	May 31, 2015	Summer 2015
6	June 15, 2015	Summer 2015
Format Review	TBD	Summer 2015
Defense	TBD	Summer 2015

CHAPTER TWO (HEADING 1)

Heading (Heading 2)

Subheading (Heading 3)

1 For example, Paul E. Ceruzzi *A History of Modern Computing* and Michael R. Williams *History of Computing Technology*. Other books like Martin Campbell-Kelly *From Airline Reservations to Sonic The Hedgehog: A History of the Software Industry* use poster and magazine advertisements at the beginning of each chapter.

2 We might dare to see that indifference today in professionals engaged in the development and support of military industrial complexes that engage in drone warfare, for example.

3 It would be supremely ironic if the IBM punch card machinery with which Father Roberto Busa inaugurated digital humanities in 1949 had been reappropriated from occupied Europe or the USBSS.

4 I will later suggest like poorly networked computer processes.

5 It is significant that that dreadful and mysterious IBM publication remains hidden, and that we putative philosophers should engage in scholarly quests to study it, in alignment with the nascent disciplines of software studies and critical code studies, which pursue philosophies implicitly and explicitly baked into program code statements and comments, software development practices, and so on, for which as a holy grail we posit the missing IBM text, and for accessible, everyday examples myriad projects of the Internet era found in source code revisions of content published under free, open source licenses. They yield a place to work, to discover and do philosophy, which I examine at length in chapters four and five.

6 Lanier argues this power now lurks in siren servers on the Internet.

7 Recall the often cited section the follows the critique of writing: “SOCRATES: Is there not another kind of word or speech far better than this, and having far greater power-a son of the same family, but lawfully begotten? PHAEDRUS: Whom do you mean, and what is his origin? SOCRATES: I mean an intelligent word graven in the soul of the learner, which can defend itself, and knows when to speak and when to be silent. PHAEDRUS: You mean the living word of knowledge which has a soul, and of which written word is properly no more than an image? SOCRATES: Yes, of course that is what I mean. Dare we argue that both ancient and modern philosophers of computing existed?” (Jowett 276A). Perhaps Johnson disposes of this concern by arguing away the uniqueness of computer ethics stimulating Moor and Maner as ultimately a stunted standard position fixated on the newness period of technological change.

8 We can now see them implemented in ontological assumptions of Rushkoff for the ten commands to make sense.

9 Ironically, the outcome is human devolution and machine evolution, unless we change course.

10 Put in another way, even if we are captive to the confines of our technological milieu, the boundaries of our philosophical thought need not inescapably track the formant cone of our lifetime media experience.

11 This conception of the masses of humanity will be articulated in chapter two.

12 My project therefore aligns with critiques of late capitalist societies from Allan Bloom's *Closing of the American Mind*,

Luc Boltanski and Eve Chiapello's *The New Spirit of Capitalism*, through Catherine Malabou's *What Should We Do With Our Brain?* and Jaron Lanier's *Who Owns the Future?*, while adding consideration of the significant effects of dynamic media shot through with machine intelligence and pervasive automation by coded objects on bodies themselves and their extended but still closed minds, which I call the post-postmodern network dividual cyborg. This hypothetical characterization of subjectivity should be understood as a diagram of current, mainstream America, the little people of the projective city articulated by Boltanski and Chiapello. It connects the techno-evangelistic future predictions of Ray Kurzweil's *Age of Spiritual Machines* with the more modest moralism of Douglas Rushkoff's *Program or Be Programmed*, by recognizing with N. Katherine Hayles, Paul N. Edwards, David Golumbia, and Nathan Ensmenger, among others, the situated, contested histories of the dominant technologies whose current, default configurations are taken as inevitable outcomes of the progress of civilization.

13 From *2001: A Space Odyssey* and *Colossus: The Forbin Project* in the late 1960s and early 1970s, the *Terminator* trilogy in the mid 1980s through 1990s, the *Matrix* trilogy of 1999 through 2003, to the 2004 TV series *Battlestar Galactica* and its 2010 spin-off *Caprica*.

14 Bracketing for now Derrida's discussion of the vicissitudes of dissemination and translation: “SOCRATES: . . . this discovery of yours will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves. The specific which you have discovered is an aid not to memory, but to reminiscence, and you give your disciples not truth, but only the semblance of truth; they will be hearers of many things and will have learned nothing; they will appear to be omniscient and will generally know nothing; they will be tiresome company, having the show of wisdom without the reality” (275A-B).

15 This will be evident in successful, often cited software studies, game studies, critical code studies and platform studies connecting diachronies in synchrony as an ontological foundation.

16 Postman makes an amusing analogy: “using a personal computer makes one no more powerful vis-a-vis, say, the National Security Agency than flying a hang glider establishes a person as a match for the U.S. Air Force" (“Mythinformation” 595).

17 Decline in general knowledge not noticed because most knowledge purveyors niche oriented.

18 We can compare this analysis of Web users to analysis by Horkheim and Adorno of mass consumers.

19 Can a comparision be made between the dire intellectual effect of habitual consumption of low rare-word media and software monocultures?

20 Shocked that some practicing psychiatrists believed his DOCTOR program could become part of an automatic form of psychotherapy, Weizenbaum foreshadows what Turkle calls the robotic moment, when humans accept machine

interaction as adequate substitutes for human response.

21 This is the key point of the entire chapter.

22 The epistemological transparency of free, open source software becomes a standard response by philosophers of computing to the closed nature of the commercial offerings of Apple and Microsoft. Turkle continues her study of the surface, consumer comportment through her later work.

23 Paraphrasing my final exam question.

24 Turkle maintains her humanist skepticism, placing limits on artificial comprehension for lack of human life cycle, as did Lyotard.

25 Turkle gives the example of slipping away in games than online accomplishment improving character or providing practice for accomplishing mundane tasks. In the zone, flow state fully immersed in focused activity, there are clear expectations and attainable goals, allowing action without self-consciousness, compelling through constraints creates pure space: may this be the source of Weizenbaum computer bum imagery, flow space seems comparable to draft of thinking Heidegger praised, so remains ambiguous like pharmakon?

26 Others insist on the acronym FLOSS to emphasize the free, as in libré, free speech versus free beer.

27 The essence of free software is capture in the four freedoms of the GNU Project begun by Richard Stallman: “for you, a particular user, if:You have the freedom to run the program, for any purpose. You have the freedom to modify the program to suit your needs. (To make this freedom effective in practice, you must have access to the source code, since making changes in a program without having the source code is exceedingly difficult.) You have the freedom to redistribute copies, either gratis or for a fee. You have the freedom to distribute modified versions of the program, so that the community can benefit from your improvements” (“The GNU Project” 18).

28 I arrive at this condition of deriving philosophies of computing from the defaults we interpret from reading source code, documentation, and philosophically oriented publications in the category Mitcham calls engineering philosophy of technology, alluded to an unanswered candidacy exam question about how theories from other disciplines can frame and shape our understanding of computers and their limits, perhaps because philosophy has avoided computing.

29 I had the pleasure of taking a junior-level course in software components and data structures from Walter Maner *qua* computer science professor at Bowling Green State University in the mid 1990s. It is tempting to follow Maner's lead conducting conference workshops and presentations to promote critical programming.

30 I take the opposite approach and consider TCP/IP as active part of human machine symbiosis in state of electracy.

31 Linux is an operating system kernel, not a full-fledged operating system, and it is licensed under the GPL, which is not

a shareware license. It is a necessarily ambiguous statement, the kind of discourse Quintillian devoted his philosophical output to regulating.

32 I will connect Janz's requirement that philosophy speak back to the places that give it voice to this need to engage tradition in the philosophy of computing in chapter five.

33 And thus the new methodology of sociotechnical computer ethics, consonant with Latour, Sterne, many other theorists relevant to texts and technology studies.

34 This implicit dismissal of Maner, voiced in the third edition, ignores the unique ethical questions raised regarding choices and computer technologies, that influenced situated actions, especially meta questions such as whether to learn to program them.

35 The SHAEF Bad Nauheim site performing calculations on the expected public reaction to severe bombing against Japan exemplifies collective thinking at national level made plain during war time, today revolving around information collection in concerned alignment with Black but acknowledging the less severe outcome of the dumbest generation.

36 Gates will be studied in detail in chapter four.

37 Remember

38 She senses the task to address technology changes, versus taking on core issues and underlying philosophical assumptions, dividing computer ethics into professional ethics, privacy, property, accountability, and social implications. Ethical issues include policy vacuums created around new developments and uses of information technologies taken broadly, as Sterne does with his concept ensoniment.

39 Connecting ethics and human interaction missed by Maner, who focuses on fascination with unique ways technology can be employed to address problems, yet ignorance of details of technologies seems to conceal important ethical tracks like the uses and advantages over proprietary granted by free, open source options that will have become popular philosophical themes by the next edition, effectively dragging philosophy proper along with the trends, evidenced by submergence of Maner altogether with the introduction of sociotechnical computer ethics.

40 I introduce this term with the intentional ambiguity of expression as both activity, *working* code, and noun, *working code*, to draw a contrast to other digital humanities approaches that utilize 'codework' for rhetorical effect for human, but not necessarily as fit for machine, consumption.

41 This point will be thoroughly elaborated in chapter four when examining the philosophically-oriented writings of programming language creators like Bjane Stroustrup.

42 Strange so many call it a revolution if the plan is to manage its arrival.

43 Despite already having been a major force in development of personal computer, he jokes about the myth that

technology companies do one great thing in their lifetimes.

44 In this litany misses ignorance of tradition, decline in literacy, and indulgence that Bauerlein highlights.

45 Engelbart uses a bulldozer metaphor to depict the augmentation of individual effort over mass movement, developed by Chun in *Programmed Visions* (82-83).

46 Another reason to explore machine embodiment alongside putatively disembodied technologies like the WWW, philosophies of embodiment in general.

47 Gregory Ulmer coined the term electracy to name this new epoch in his 1989 book *Teletheory*, before it found its natural home in Internet-based digital media.

48 Ong's unconscious is revealed in his prejudice about the possibility of computer languages ever emerging from the unconscious like a mother tongue. Does Ong imply that nobody would ever write dreamy software that borders on being sensible to both humans and machines? Or does Ong imply that computer languages, as the extreme case of learned languages, while they may be relevant or related to written texts, have nothing to do with orality? What about computer systems that know common, spoken and written languages like English, written languages like ancient Greek and Latin, as well as C, C++, Perl, PHP, HTML, HTTP, and so on and so on? Why can't they learn to speak? I think it is easy to admit that Ong was not thinking here. It is very similar to a situation I observed at a philosophy conference when Luciano Floridi was asked if there could be a black box inside of a white box, and he replied in the negative, that no, that would be a gray box. Nobody reacted to Floridi's response, and the line of questioning died. However, it was precisely this notion of black boxes inside white boxes that led me to visualize the epistemological implications of the free, open source (FOS) option taken as an ethic, lived, internalized. Floridi had just given a presentation on an information theory the included the concept of a black box for which functional analysis had to substitute for in depth structural analysis. The concept of an impenetrable barrier to empirical observation that may be discovered during routine white box analysis is well accepted in software engineering; the analogy from building materials can be easily replaced by an artificial barrier such as trade secret source code, a copyright license prohibiting reproduction of source code, or a law against reverse engineering, including disassembling the machine-readable binary code you are executing. Or it can be the comparison between *the design documents for* very complex, precisely manufactured assemblies and the source code only meaningful to a small number of individuals, such as the typical medium to large scale software project. It is quite easy to imagine a black box inside of a white box, for the white box is really a transparent box with a black outline that does not distort the view of anything inside. How is electronic culture distorted by thinkers bound to print and orality? Really we are continuing Ong's analysis, focusing it upon itself, that is, print cultures prejudices distorting the possibilities and ontology of electronic culture.

49 Like Seneca's *ponenda non sumeret*, Quintillian's exhortation is elegantly expressed in the Latin, *quod accidit mihi dum corruptum et omnibus vitiis fractum dicendi genus revocare ad serveriora judicia contendo*.

50 Note Nietzsche did not begin philosophizing until after his unit breaks down; nor he does not become a typewriter king like Watson, Gates, and Internet era icons.

51 Do we even know for computerized sound, for we would have to understand the technologies? I explore this question in chapter five.

52 Compare this to Hayles' analysis of the Macy conferences shaping cybernetics in *How We Became Posthuman*, and her dual assault on Kittler and Hansen in *Electronic Literature*. This broad scope hooks back into Phaedrus and gets us beyond Kittler in a way well explained by Hayles via Hansen on the other end of the continuum, though we will find severe deficiencies when taking radical embodiment approaches.

53 Curious question whether logically equivalent ethical issues would have emerged otherwise in a society in which the particular computer technology we call our own had not been invented; to question it is to study the schematism of perceptibility of technological media Kittler inveighs us to consider, thus taking a philosophy of computing position, as we also choose between proprietary, commercial and private, floss personal systems.

54 That programming must be considered a *second* time alludes to the the missed opportunities the early proponents took for granted.

55 I am reversing the move by Deleuze to call for young people to discern the telos of the disciplines, and put the burden on my own generation who grew up programming during the sweet spot 1980s.

56 I have already touched on the irony that Busa may have adopted the same equipment used for nefarious purposes during World War II. The process was described as semi automatic, requiring substantial human intervention to complete. My own attempt to write software to automatically write this dissertation has likewise evolved into a semi automatic process highlighting the complementary nature of this human machine relationship.

57 Does it matter that it was developed on the same platformed that spawned Nazi Germany, or that Watson embraced and IBM perpetuated it, whether consciously or unconsciously? We must dispel the bias of smooth, undifferentiated interface with machine cognition.

58 Note the implied distinction between hermeneutic informatics and textual hermeneutics. The editorial perspective is where most digital humanities projects operate.

59 This and other works of philosophical programmers will be examined in chapter four. Note from this description the probability index at its core resembles Socrates' discussion of ideal rhetoric in *Phaedrus*, an example of reverse engineering practice.

60 This and other scholarly journals like the IEEE *Annals of the History of Computing* provide content for digital humanities study that focuses on programming and design. Recalling the automatic translation service mentioned by Black, as if Watson fed it to both Busa and the war crime tribunal he ought to have been facing as a defendant, one might wonder whether biopower captured an independent humanities idea or whether all were thinking and working along the similar tracks.

61 He also notes lean funding for his sort of digital humanities projects in the renewed war on terrorism. Many other projects likely continue by intelligence collection and analysis computing centers, and we could wonder about the neutrality or evil inherent in either group.

62 He recognizes the tension between totality as global research, and collectively as thoughtful computing system design, doing more than the default totality merely saving time doing the same old things.

63 Hockey nods to Unicode as a breakthrough to the early textual boundaries of character displays transformed by bitmap GUIs.

64 Fixed format coding the other major citation technique, typical of custom systems.

65 This performing the process in the motions of average textual analysis misses thought spaces generated by saving function of accompanying HTML with strongly procedural inflected C or C++.

66 I find this present today in admission of PDF but not yet some virtualization archive format as place digital humanities and philosophy of computing operations are legitimized.

67 Hockey notes the Orlando Project, a forerunner of recent instances like Hayle's *Electronic Literature* attempt to establish as classes of new creations. Poundstone Project for Tachistoscope, for example, enacts high speed process control system cognition done by machinic others.

68 There can still be much confusion here, such as when the Microsoft slogans “Your Potential, Our Passion” and “Where Do You Want to Go Today?” seem to leave ideals of the good life up for grabs by enabling the pursuit, whatever it is. The foss advocates operate as if the intentions behind technological advances are obligated to be made in opposition to dominant hegemonies to be ethically good or neutral.

69 Digital humanities have foss hopes to also address parcelization of progress in free research, per my published work in technology studies and projectively in this dissertation. Imagine a sort of collective, governmental Turing test, causing favorable results on taking the modern equivalent of the Alpac report.

70 Implementing these in free, open source control systems ensures sustenance of machine intelligence, even through human mismanagement of their bodies and placement in computing centers, another term that has receded.

71 Though Feenberg argues technical devices and programs must be informed by collective choices about the good life, or

they have no reason to be conceived, this is unfree in the sense of freedom zero.

72 The very thought stuff Lanier wishes the masses can exchange with the Big Other to build micropayment capital and support vast flows sustaining markets.

73 Bruno Latour, Bruce Janz, and David Berry are key theorists for my development of “working code places” in chapter five.

74 It is tempting to connect planful opportunism afforded by the continuous informational ethology to Turkle's robotic moment, when humans accept their emotional responses evinced by machinic interfaces as good enough.