

Ecological Ethics and Media Technology

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After seeing electricity, I lost interest in nature. Not up to date enough.

~ Vladimir Mayakovsky¹

Brought along some gadgets for you to see

Here's a crazy little thing we call TV

Do you have electricity?

We're humans from earth

We're humans from earth

You have nothing at all to fear

I think we're gonna like it here

~ T-Bone Burnett, "Humans from Earth."

Ecological ethics barely figures into the way media and communication researchers think about media technology. By ecological ethics, we mean the subset of ethics concerned with "how human beings ought to behave in relation to non-human nature" (Curry, 2006, p. 47). The environmental impact of electronic waste (e-waste) is just now starting to gain traction in media and communication studies (Sterne, 2007; Parks, 2007; Ellis, 2007, pp. 217-219; Maxwell & Miller, in press; Miller, 2007b). Here the ethical response focuses on the environmental (including human-bodily) harms associated with disposal, dismantling, and recycling of media technologies. However piecemeal, this interest in e-waste is a salutary advance toward an eco-ethics in media studies; it is one among many environmental issues that pertains to the study of media technologies. The essay aims to alert media and communication scholars and students to the ecological context of the technologies that the field has expertly studied during its half-century existence.

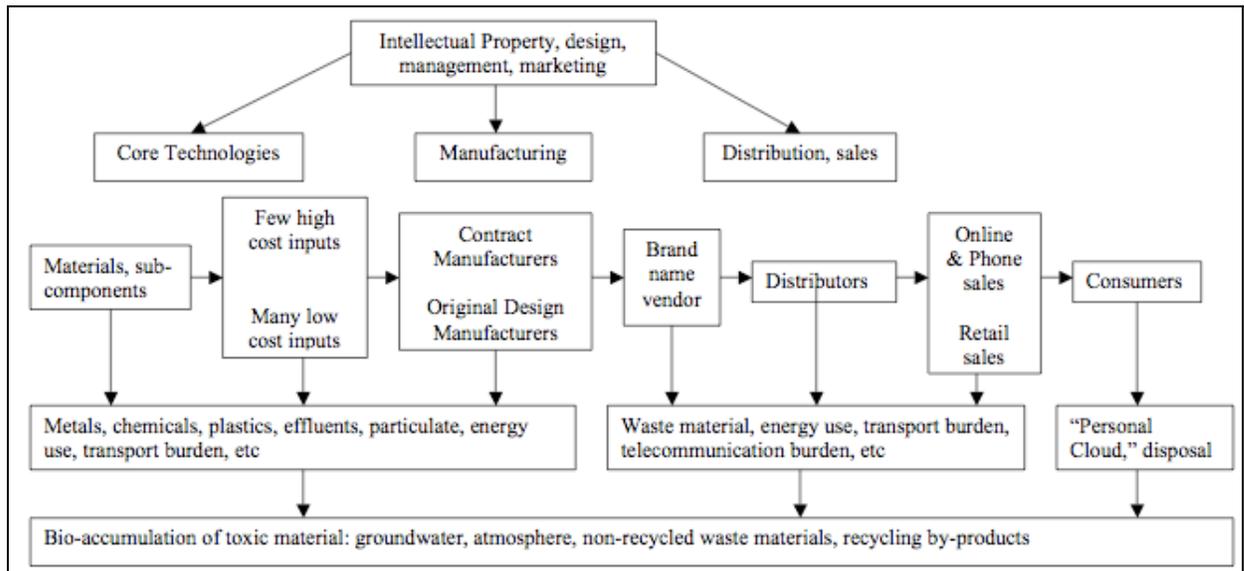
But why should media studies develop an eco-ethics at all? The answer is hammering hard from outside the academy. We inhabit an ecological crisis that demands rethinking of first principles, research frameworks, methods, activism, and policy work. Among other interconnected problems, this crisis consists of climate change (global warming) caused by: 1) overproduction of carbon dioxide (CO₂); 2)

¹ Quoted in Macauley, 1996, p. 114.

pollution in the over-developed world; 3) industrial dumping in less-developed regions (disrupting the biological development and immune, endocrine, and hormone systems of "virtually all organisms"); 4) rapidly diminishing biodiversity, the Earth's "sixth great extinction," unique for being caused by one species (guess who?); and, 5) the rapid decline of habitat (50% of the Earth's forests are gone, as are 25% of sea habitats) (Curry, 2006, pp. 10-13). The public response to this crisis in the U.S. has seen a doubling in membership of environmental groups between 1980 and 2000, with numbers rivaling membership in political parties (Dalton, 2005). Meanwhile, calls for interdisciplinary efforts to confront the eco-crisis have grown within the academy (Rose & Robin, 2004).

There is a spectrum of relevant ecological concerns that the field of media studies could confront as ethical challenges in the near future. Note these examples: Media owners are numbers 1, 3, 16, 22, and 39 among the top 100 polluters in the U.S. (Political Economy Research Institute, 2004). An estimated 2% of all carbon dioxide emissions come from the global information and communication industry, or about the same as the aviation industry (Gartner Estimates, 2007; cf. Corbett & Turco). Approximately 1.5% of the U.S. electrical supply (about US\$4.5 billion worth) is consumed by server "farms" powering our network society (Wald, 2007). High-end magazine publishing in the U.S. needs about 35 million trees annually to produce 18 million titles, 90% of which are trashed within a year of publication (Independent Press Association et al., 2001, pp. 5-10). Communication towers and wires kill up to 50 million birds annually in the U.S. alone (in the past, the FCC required annual reports on this problem) ("Avian/Communication Tower Collisions," 2004).

In addition, we should be confronting other imposed health effects such as the following phenomena: wildlife gradually being poisoned by toxic emissions; a rising body burden of toxins caused by discarded electronics (Grossman, 2006; Rydh, 2003); radiation exposure from TVs, computer monitors, cell phones, laptops, telecommunication and electrical towers, power lines, etc. (Cox, 2007; Lean, 2008); space junk from communication satellites (more than 330 million pieces orbiting earth) with messy discharges of toxic chemicals and compounds, as well as nuclear waste (Broad, 2007); and now media-related nanotechnology, whose toxic byproducts and waste are not well understood at the atomic scale (Center for Responsible Nanotechnology <crnano.org>; Schoenfeld, 2007).

Generic electronics supply chain in an ecological context

Source: Modified from Linden et al., 2007: 3.²

Understanding the ecological context adds a new level of complexity to the study of media and society. The sheer materiality of the technology begs the question about the neglect of its environmental impact in the key writings of our discipline. In 30 years of growing awareness of a global ecological crisis, where has the environment figured in the histories of media technology, in our industrial and institutional research/political-economic work? We have analyses of symbolic environments in the metaphors of McLuhanites and media ecologists and in notions of “new” media-environs (cyberspace, interface, etc.). We have analyses of environmental policy as an information and cultural phenomenon (Felleman, 1997). And we have some valuable engagement with media coverage of the environment (see an account in Miller, 2007a, chaps. 3 - 4), and critical writing on environmental themes in popular culture (Carmichael, 2006; Cubitt, 2005; Hochman, 1998; Ingram, 2000). But none of these reach into the material environmental impact of media technologies.

² This table was modified to correct the impression that this value chain exists outside a real, material ecosystem. The authors called the iPod the latest triumph of Apple’s “thriving ecosystem”—i.e., the New International Division of Cultural Labor—by assemblage across Korea, Japan, China, Singapore, Taiwan, and the U.S., in keeping with a US\$8 billion corporation that has half its liquid assets held by overseas subsidiaries from Ireland to Singapore (Linden *et al.*, 2007, pp. 2, 6; Schaefer & Durham, 2007, p. 49; for an approach to the New International Division of Cultural Labor cf. Miller et al., 2005).

What would happen to game studies if, rather than rehearsing debates about ludological, narratological, and effects approaches, it confronted the fact that millions of cartridges of Atari's game adaptation of *E.T. The Extraterrestrial* (Steven Spielberg, 1981) were buried in a New Mexico landfill, broken up by a heavy roller, and covered in concrete to consign them to history; or that cables in Sony's PlayStation 1 consoles were found to contain deadly levels of cadmium, a fiasco that cost Sony US\$85 million to fix (Engardio, 2007)? What would it mean if film studies were required as an ordinary part of its work to evaluate motion picture production ecologically?³ What would it make, for example, of *The Beach* (Danny Boyle, 2000)? Thai environmental and pro-democracy activists publicized the arrogant despoliation they experienced when Fox was making this movie in Maya Bay, part of Phi Phi Islands National Park. Natural scenery was bulldozed in late 1998 because it did not fit the fantasy of a tropical idyll. Sand dunes were relocated, flora rearranged, and a "new" strip of coconut palms planted. The producers paid off the government with a donation to the Royal Forestry Department and a campaign with the Tourism Authority of Thailand to twin the film as a promotion for the country. Meanwhile, the next monsoon saw the damaged sand dunes of the region collapse. Natural defenses against erosion had been destroyed by Hollywood bulldozers. All the while, director Boyle claimed the film was "raising environmental consciousness" among a local population that was allegedly "behind" U.S. levels of "awareness" (Miller et al., 2005). Is this question on our agenda when we examine the film industry? If not, why not?

Rather than glibly respond that *It's the Hardware, Stupid!* we recognize that media and communication scholars have had no problem in the past dealing with a range of critical insights to other ethical problems, including those related to social harms (violence), cultural harms (prejudicial stereotypes), economic harms (ownership), or political harms (propaganda). Surely we can extend these ethical commitments to environmental concerns and at least provide an additional chapter to such otherwise useful recent titles as *Media, Risk and Science* (Allan, 2002) or *Media Technology: Critical Perspectives* (van Loon, 2008)? The eco-crisis presents media studies with an eco-ethical choice: either continue to document and assess the growing consumption of media technologies without understanding their ecological context, or advocate policies and influence politics to reduce the consumption of media technologies—not an easy choice for a field hooked on iPodpeople and PCers. We think it's time to assume intellectual responsibility for the ecological dimension of the media, and deal with difficult ethical challenges posed by the eco-crisis.

A point of departure could be the equation used in environmental ethics. It explains the eco-crisis as the product of four inter-related factors: Population, Lifestyle, Organization of Society, and Technology (Impact=P x L x O x T). While none of the factors can be extricated from the complex interdependence causing the crisis (Curry, 2006, pp.13-18), they point to distinct ethical challenges in media research and analysis. Media and communication researchers might be mindful of population size as a factor contributing to the eco-crisis, but the field's strengths are probably best directed at questions of lifestyle, social organization, and technology. Lifestyle in this ecological context refers to (over-)consumption of

³ Though focused on waste-management issues related to Los Angeles-based film production, Corbett and Turco (2006) illustrate the complexity of such research and provide examples of greenish production practices.

resources and material goods as well as the global infrastructure of consumption, characterized by stratification that pits the overindulgent rich—the 5% producing the largest amount of greenhouse gasses and consuming 40% of the Earth's resources—against have-not regions, with gaps increasing annually. Consider that it would take three planet Earths for the current global population to enjoy an “American lifestyle” (Curry, 2006 p. 15). The factor of social organization refers to the way differently organized societies (social democratic, capitalist, and socialist) respond to the eco-crisis, and here media policy and political economic approaches to the media could contribute. Again, this area would have difficult choices regarding our ethical and political commitments: can an ecological ethics wedge its way into research and advocacy that now focuses on ownership policy, content diversity, and democratic media reform?

The technology factor of the eco-crisis poses the clearest ethical challenge (or set of challenges) to media studies, a field of great depth in historical and critical work on media technology (for examples, see among others, Barnouw, 1990; Douglas, 1989; Noble, 1977; Schiller, 2007; Starr, 2004; Sterling & Kittross, 2002; Winston, 1998; Castells, 1996-1998). Edging this research into environmental problems means it will have to address the ecological context of media technology: 1) the environmental burdens of energy generation and consumption throughout a medium's life cycle, from production to consumption and disposal, including transportation throughout this cycle; 2) a medium's chemical and heavy metal composition; 3) prior inputs from the earth (extracted via mining, drilling, logging, etc.)—the *source function* of the eco-system; and 4) subsequent outputs into the earth (deposits into air, land, and water)—the *sink function* (Korten, 1996, p. 23; Silicon Valley Toxics Coalition). The effects of these inputs and outputs outlive the medium's existence, in some cases for generations, through deforestation, CO₂ emissions, and bio-accumulative poisons like PCBs, dioxin, and so on. The ecological dimension of media technology points to ethical questions that the field must not shy away from. The most challenging will be how much communication and entertainment media is enough to attain a system that serves everyone on the planet fairly without contributing to “ecological suicide.”

Media studies could draw on three schools of ecological ethics to develop an ethical orientation to the study of media technology: at two extremes are anthropocentric (“light-green”) ethics and ecocentric (“dark-green”) ethics, with an intermediate (“mid-green”) ethics combining elements of the others (Curry, 2006). These schools of eco-ethics can be distinguished by their answers to questions of value (what is valued, what entities qualify for moral consideration, and what matters most), rights (duties and rules that protect individual and collective entities that are valued), and consequences (utilitarian considerations of actions and motives that affect the well-being or happiness of those with moral standing). The lines separating these are often blurry (like all ethics, there are no iron-clad rules of operation), but each in its own way has virtues (and limitations) that can inform an eco-ethics in media studies.

For anthropocentric eco-ethics, non-human nature has no moral standing (hence no rights) except in relation to how humans are affected by changes in nature. Humans rule the Earth by virtue of their intrinsic value, but they need not rule out an ecological ethics that helps them flourish, for example, by finding instrumental value in nature as a means to human happiness (in its utilitarian/consequentialist versions). A communication philosopher might argue that all eco-ethics are unavoidably anthropocentric because questions of value, meaning, and interpretation are always centered on human experience, perception, and language. Good point, but the eco-ethical response asks whether “the privileging of

human beings . . . at the expense of all other forms of life" is justified (Curry, 2006, p. 45). There are other aspects of anthropocentrism, foremost among these that it has provided the most politically expedient form of ethical discourse shaping environmental policy (at least in capitalist societies), namely, self-interest. But even this is a complex matter, for the narrow confines of self-interest can allow for a virtuous ethics oriented to non-human nature, i.e., living an ecologically sound life that accumulates ethical substance to one's character.

In contrast to human-centered ethics, ecocentric ethics holds that nature (subsuming humanity in some versions) is the "ultimate source" of all value and attempts to specify right/wrong and good/bad human action in relation to this particular interpretation of value. Ecocentrists are convinced that "some or all natural beings, in the broadest sense, have independent moral status" (Curry, 2006, p. 64). Human domination of nature is fundamentally wrong/bad, and there is a right/good way to live an ecologically healthy life by putting the Earth's well-being first. For some, this is a matter of an ethical regard for the integrity and ineffability of nature (think of Aldo Leopold's "land ethical" wonder at the sleepy skunk stirring during a mid-winter thaw [1949] or William Connolly's "affinity of affect" for an unruly Australian cockroach [2005, p. 90]). For others, as in Gaia theory, ecocentric ethics reside in the notion of Earth as the one-big-organism. It also informs eco-political critiques of class, race, and gender oppression that Left biocentrists and ecofeminists have argued is inextricably tied to capitalist/masculinist subjugation of nature under the sign of growth (Callicott, 1994, pp. 36-41; Curry, 2006, pp.63-100).

An intermediate form of ecological ethics accords some intrinsic value to non-human nature but not as completely as ecocentrism does. Mid-green ethics is not fully anthropocentric, though it rests on the principle that humans' "moral considerability" can be extended to other (sentient) beings, primarily non-human animals. Proponents of mid-green ethics can be found among advocates of animal liberation (Peter Singer) and animal rights (Tom Regan) as well as in biocentrism or life-centered ethics (Paul Taylor). However, when there is a conflict between humans and other life forms, this intermediate ethics tends to privilege human interests (Curry, 2006, pp. 55-62).

How would these apply to media studies? Anthropocentric ethics is fundamentally individualist but relies rhetorically on collectivist political discourse. Most environmental policy debates make sense via anthropocentric eco-ethics by pointing out the cost of environmental degradation to collective human life. This characterizes the consequentialist assumptions of research on e-waste, global warming, alternative energy, air and water pollution, greening of industry, and so on, where humanity is seen as the ultimate loser of bad ecological action (Curry, 2006, chap. 6). In this eco-ethics, media technologies carry both promise and peril for the environment. Media technologies are tolerable and good because they enhance people's ability to act and communicate as green consumers and concerned eco-citizens; they work against our well-being when they pose hazards and deposit toxins into the eco-system or diminish our enjoyment of nature (those ugly towers and cables) or otherwise foul the lives of creatures sharing the Earth with us. While the ultimate source of value resides in our species, this ethical orientation has the potential to sustain enough empathy for non-human nature to introduce important qualitative concerns into research and discussions of media technology (within limits discussed below). This could entail revisionist work on everything from media technology's environmental impact on habitats and biodiversity

to how the environmental movement itself uses polluting media technologies as tools of activism (cf. Castells, 1997, chap. 3).

Likewise, there is room for an intermediate eco-ethics in media studies to influence research on the development and deployment of media technologies, for example, in order to attenuate harm to non-human animals that share the Earth with *numero uno*. There are limitations to this "mid-green" eco-ethics that the field would have to confront, including the problem of moral extensionism (which has difficulty perceiving the collective interdependence of non-human nature in its assumption that rights can be extended to individual species other than humans under certain circumstances) or the way that the replacement of human chauvinism with animal chauvinism (animal rights) can preempt debate (Curry, 2006, pp. 55-62).

But media studies would be profoundly disrupted were it to install an ecocentric ethics into its thinking on media technology. Basically, an ecocentric media studies cannot embrace a technology that degrades non-human nature in order to flourish within it. That's a real deal breaker. But let's think about how media studies would have to change its take on media technology from an ecocentric ethical position, *if it could*. There are possibilities and limits to this happening. The possibilities will depend on whether media studies can make a fundamental shift in first principles to give the Earth's well-being preeminence in the study of media technology. For the ecocentrist, the eco-crisis makes this necessary. This shift requires an absence of moral self-righteousness about the value of media technology, a conviction that "everything on this Earth depends on it and its vital constituent parts," and the resolve to accept that when "*human good, values and interests clearly conflict with the well-being of the Earth, the former must give way.*" This last "realization cannot ever be taken for granted—as much as possible and wherever and whenever possible, *it must be argued, publicized, fought for and lived*" (Curry, 2006, p. 112; emphasis in original). At this point in time, this particular ecocentric ethics can only advance by acting pragmatically in a pluralist world in which it must live and work, with agonistic respect, alongside both light- and mid-green eco-ethics; it must be ready to forge alliances, but not at the expense of ecocentric principles (Curry, 2006, p. 113). With this reservation in hand, an ecocentric ethics in media studies would still require a paradigm shift far more radical than either anthropocentric or intermediate eco-ethics demands. In short, it would entail a disenchantment of technology and a re-enchantment of non-human nature (McLaughlin, 1993).

The enchantment of technology is entwined with the transcendence of non-human nature as key indices of modernity (in both capitalist and socialist versions). The domination of nature by science and industry blends chemical magic with rationality, reason with machinery, to transform the Earth into an instrument without intrinsic value or meaning (McLaughlin, 1993). The genealogy of "millenarianism, rationalism, and Christian redemption" profited from this disenchantment of non-human nature, gaining dominion and stewardship over the Earth as its rewards (Callicott, 1994, pp. 14-21; Dinerstein, 2006, p. 569; Nye, 2006, p. 598; Curry, 2006, pp. 26-27; & McLaughlin, 1993, p. 99). Enchantment attached itself to technological invention to the same degree that non-human nature was dislodged from pre-modern ways of seeing which, along with nature, became ridiculous, inert, a spectacle to adorn nation-building and an object of domination and exploitation (cf. Callicott, 1994). Frederick Engels was one of the first to suggest otherwise when he perceived and documented in vivid detail the environmental ugliness of

industrialism, albeit in anthropocentric terms as a shameful blight on English workers' lives (Engels, 1845/1892).

Since the 19th century, labor has been thought of as something to be controlled long-distance, connected to transnational textual and military domination but also set against itself via an ever-grander division of itself. Similarly, geographical enlargement of the division of labor driven by capitalist expansion changed our relation to the global environment, as resources supplying industry were increasingly drawn from outside local ecosystems. This global system thus brought about a dislocation of experience of environmental conditions that transformed "ecosystem people" into "biosphere people" (McLaughlin, 1993, p. 21)—marking the parallel alienation of intrinsic value from both labor and non-human nature. Ned Lud and his followers recognized that capitalists who did not do productive work controlled machinery, which controlled the lives of those who *did* work; what they couldn't yet perceive was the growing interdependence between their exploitation, the enchantment of technology, and the degradation and disenchantment of non-human nature. (*A propos*, Lord Byron sought the death penalty for opponents of machines in his maiden speech in the Lords, just months after summering with the Shelleys, even as the first Luddite piece of science fiction [*Frankenstein*] was being created by Mary) (Pynchon, 1984).

Media and communication technology inherited their own enchanted life from these antecedents (Mosco, 2004). The advent of the train, the telegraph, and the photograph was "a victory over time and space" (quoted in Briggs & Burke, 2003, p. 104). By the 1890s, even as vast a country as the United States could see space and time "enclosed . . . running on the same clock of awareness and existing within a homogeneous national space." National networks were designed to homogenize conduct, both governmentally and commercially (Carey, 2003, p. 186). The rhetoric about electricity promised that it would be possible to "talk in our voices hundreds of miles away" and record votes and the latest popular melodies (quoted in Briggs & Burke, 2003, p. 147). Debates over the possibility of a new world order, brought on by the spread of media to the people, foretold an end to the chauvinism of sovereign-states (Marvin, 1988, pp. 192-193). This combination of domineering overreach and utopian imagination by state and capital were as typical then as in our own time—just substitute "Internet" for "telegraph," "radio," or "television."

With each binding and unbinding of time and space, the visibility and audibility of signs from elsewhere stimulated discussion of the sublime qualities of media technology (both utopic and dystopic) but further obscured the ecological context (here and elsewhere) of such marvels. As capital and capitol alike continued to press communication technology into service for social and commercial dominion in the 20th century, a new boosterism placed media at the center of economic innovation by asserting that they encompass corporate and governmental information technology (which is where even more money is made and yet greater power exercised) (Garnham, 2005). By the 21st century, a former Chair of the U.S. Federal Communications Commission, Reed Hundt, and one of his offsidiers, claimed that the principal goal of communications policy was to increase productivity through "decreases in the price of transmission and increases in the amount of information that can be cheaply and rapidly moved from place to place" (Hundt & Rosston, 2006, p. 2). The enchantment of media technology achieved a new luster with the promotion of information networks alongside water and power as the bedrock of this new world economy (Bar with Simard, 2006). At the same time, consumers embraced the new "information" technologies, encouraged

no doubt by pervasive marketing and advertising of digital gadgetry. By the early 21st century, the Environmental Protection Agency estimated that U.S. residents owned approximately three billion electronic devices (2007, p. 1) with well over half these purchases made by women (Twist, 2005). The Consumer Electronics Association said that US\$145 billion was expended in the sector in 2006 in the U.S. alone, up 13% on the previous year, referring joyously to "the consumer love affair with technology continuing at a healthy clip" ("CEA," 2007).

Meanwhile, media and communication research on technology surged to comprise over one-fifth of the field's book titles available in the U.S. (Aslama et al., 2007, pp. 59, 82). But it seems that none of them thoroughly investigate the ecological context of media technology, not to mention ethical concerns with lifestyle and societal organization as factors of the eco-crisis (please prove us wrong). Still, it is not necessary for media studies to make a wholesale conversion to ecocentric ethics, even if it could, in order to develop an ethical regard for non-human nature. But it *is* vital to recognize that the enchantment of technology that grips even the most critical work in the field cannot be sustained in the face of the worsening eco-crisis. In our time, the political role for ecocentric ethics will have to be modest (*contra* unhelpful dogmatic versions), hoping at best "to acquire sufficient influence in the world to *check* anthropocentrism, instrumentalism and utilitarianism" (Curry, 2006, p. 67; emphasis in original). With this in mind, a "light-green" eco-ethics might begin the disenchantment of technology in media studies, to nudge research seeking a balance that lightens environmental burdens while allowing us to "enjoy, invent and be free in the modern world" (Robins & Webster, 1999, p. 62). Let's see how that goes.

In anthropocentric eco-ethics, we can find seriously divergent interpretations of the value of humanity, because not all anthropocentric eco-ethics accords equal value to all populations. In the U.S., for example, environmental policy is based entirely on cost-benefit analysis (CBA), a risk-management technique that lies at one extreme of anthropocentric eco-ethics. CBA is used to determine whether a particular regulation justifies its cost (this can influence decisions about whether mandated recycling is an efficient use of resources, or if losses to the logging economy outweigh benefits of protecting endangered wildlife, etc.). CBA works by monetizing human and non-human life through various methods, such as "hedonic pricing," which would determine the market value of a forest, for example, by correlating housing prices with proximity to undeveloped land. In this case, the benefit of not developing *all* the forestland would justify mandated conservation of *part* of it. Critiques of this approach include the arbitrariness of assigning monetary value to human life and other non-market goods, the failure to account for intergenerational equity, and elevation of technocratic decision-making at the expense of public input and participation (Clowney, 2006). CBA also practices a spatial politics that fails to address inter-territorial equity. Its eco-ethics, such as they are, stick to the kind of concentric thinking that presumes the zones of the biosphere in which it is applied have merely relative connections to zones beyond the boundaries of the analysis. This concentric view of the earth allows for a number of other cultural assumptions about the relative value of communities living across multiple lines of difference, territorial or otherwise (Connolly, 2005, pp. 41-42).

Media studies has had to deal with CBA in almost all matters associated with policy and regulation, so this might be one area where the field's potential "light-green" eco-ethics could get a foothold. Consider the concentric logic at work in e-waste recycling, keeping in mind the way it relativizes

cultural norms across different societies. Most electronics recycling is done in the Third World by pre-teen Chinese, Nigerian, and Indian girls, picking away without protection of any kind at discarded First World electronics in order to find precious metals, then dumping the remains in landfills. Dust laden with harmful heavy metals from circuit boards and other components settles in workshops and blows onto roads and other public places, while the recovered metals are gathered and sold to recyclers, who do not use landfills or labor in the First World because of environmental and industrial legislation *contra* the destruction to soil, water, and workers (Basel Action Network & Silicon Valley Toxics Coalition, 2002; Lee, 2002; Leung et al., 2008; Pelta-Heller, 2007; Shabi, 2002; Tong & Wang, 2004; Wong et al., 2007, pp. 435, 441). Here, pollution in the Global North is culturally intolerable (if politically tolerated), while being treated as culturally and politically acceptable in poorer regions of the world, a move that exports environmental risks as per the notorious prescription of former World Bank econocrat and Treasury Secretary Lawrence Summers (to wit: "Just between you and me, shouldn't the World Bank be encouraging more migration of the dirty industries to the LDCs (lesser developed countries?").

Underlying the tensions between "bean counters" and "tree huggers" (Clowney, 2006, p. 109) is a techno-scientific ideology that determines how environmental risk is distributed. The discourse of risk management masks the fact that decisions are actually made to define the number habitats and creatures that will die or be sickened by environmental harms. Science (or more narrowly, techno-science) plays a role in this moral detachment by providing legitimacy via measurement of "safe amounts" of exposure to toxins and pollutants (science's role is paradoxical and deserving of a longer discussion, but it should be noted that scientific research is also the primary source of important quantitative measures of the eco-crisis, along with providing a language of critique and an array of expert-activists). The language of risk management puts ethical considerations in an apolitical frame of technocracy, as compared to language that denotes more precisely the politics of what institutions like the Environmental Protection Agency do: they determine how a particular harm will be allocated (Michaelson, 1996, p. 1907). If we press this ethico-political point into our studies of the global flows of harms, that is without the pretensions of risk managerialism, we can provide a critical framework for understanding the politics of recycling, hazardous waste disposal, and the like. Routine environmental despoliation, global labor competition, cyclical recession, declining life-long employment, massive international migration, developments in communication technology, and the rolling back of the welfare state . . . alongside income redistribution toward the wealthy have left denizens of post-industrial societies factoring costs and benefits into everyday life as never before—while their sense of being able to determine their future through choice is diminished (Latour with Kastrissianakis, 2007; Rikagos & Hadden, 2001; O'Malley, 2001). This is why some have called managerialism one of the ecological "curses of our time," for its "belief that human beings have not only the 'right' but the ability, even if only potentially, to successfully manage the world" (Curry, 2006, p. 28).

Anthropocentric eco-ethics contains alternatives to environmental CBA and risk management, including the *precautionary principle*, *absolute prescriptions*, *sustainable development*, and *cost-benefit shortcuts* (Clowney, 2006, p. 125). The precautionary principle holds that "our knowledge of the effects of our actions is always exceeded by our ignorance" (Curry, 2006, p. 48). This standard lays the burden of proof on those who would introduce potentially harmful substances or practices into the environment in circumstances where there is no scientific consensus about such actions' consequences. This "better safe

than sorry" environmental principle is very strong in international agreements and offers the most serious challenge to CBA "bean counters." Absolute prescriptions are unconditional bans on known pollutants and toxins; this was the standard that informed much of 1970s' environmental law. Sustainable development refers to efficient use and equitable distribution of natural resources for long-term socio-economic development. CBA short-cuts include technological fixes that offer qualitative improvements without strict adherence to quantitative factors of regulation (Clowney, 2006, pp. 125-130).

Of all these alternatives, sustainable development has been rendered the most controversial through its casual overuse by actors across the political spectrum, from free marketers to left ecocentrists. Ideally, the term denotes a standard that "rules out all practices except those that are indefinitely sustainable" by the Earth's ecosystem (Curry, 2006, p. 48). Sustainability is more commonly deployed as meaning a balance struck between economic development and environmental protection, though this tends to mean qualitative development rather than pure quantitative growth. As environmental economists point out, there is no such thing as sustainable growth: it's "a bad oxymoron—self contradictory as prose and unevocative as poetry" (Daly, 1996, p. 193). The virtues of sustainable development are that: it accounts for intra- and intergenerational equity; it allows for open participation, if not by affected communities at least by their representatives; and it is recognized in international agreements to assure a scale of inter-territorial equity, even when the parties disagree on its meaning. It thus offers a more equitable alternative to CBA's concentric comprehension of the world.

The disadvantages of sustainable development concentrate at the point at which the question of quantitative economic development overtakes other concerns. In its weakest form, sustainable development becomes "little more than 'sustainable' capitalism" (Pepper, 2000, p. 451; Deutsch, 2007, p. C1). Economic self-interest pushes eco-ethical self-interest into a little corner of sustainability. Herein lies a key vulnerability of anthropocentric eco-ethics. Self-interest that does not perceive the intimate relation between human and non-human beings will tilt the balance towards satisfying human needs.

A new direction in anthropocentric eco-ethics could derive from "green citizenship." According to political theorist Hartley Dean (2001), environmentalism has affected citizenship in three ways:

- Claims to rights have expanded to include clean air and water (this was suggested at least as early as 1739 when Benjamin Franklin argued that "public rights" over Philadelphia's air and water should supersede private rights of industry).
- National boundaries and interests have been brought into question by the border-crossing impact of despoliation (multi-lateral agreements were sought throughout the 20th century, but it was the 1967 United Nations conference on the environment that inaugurated international environmental policy (Hopgood, 1998, p. 2).
- Corporate economic citizenship has been rearticulated beyond gleeful receipt of welfare.

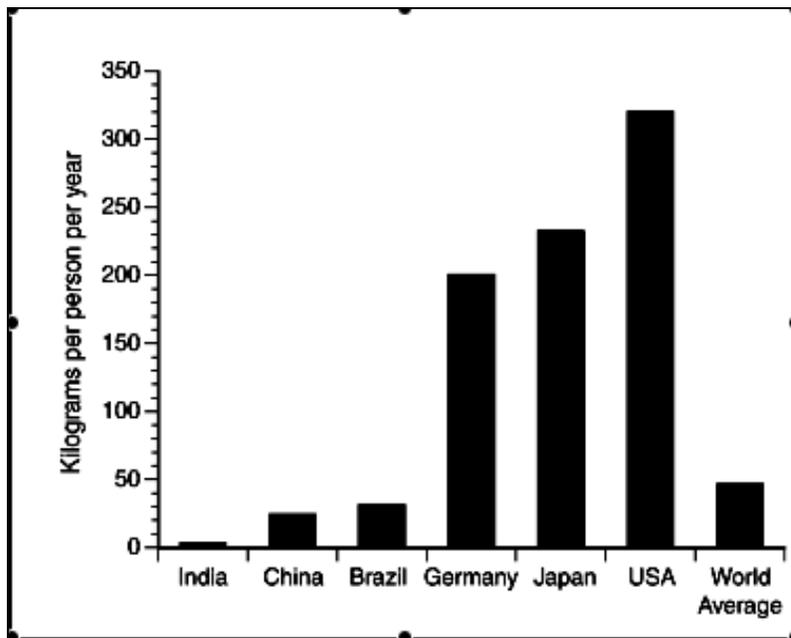
More than an addition to the rights and responsibilities of territorially-based citizenship, this amounts to a critique of them within the sustainability framework of anthropocentric ethics. While still essentially human-centered, this ethico-political corrective is focused on saving infrastructure and heritage

from unsustainable capitalist expansion, and thus dowses the global public sphere with green intentions that must necessarily confront challenges posed by the eco-crisis. Rather than looking to the next generation to carry on, forecasts must look centuries ahead in order to guide policy today, so elemental are the risks created by industry (Dobson, 2003).

This is the kind of inter-generational thinking that must pervade our field if we are to confront our logo-centric interdependence on the technology we engage, criticize and promote. We conclude with two examples of eco-ethical challenges that face media studies. One case is relatively uncomplicated, the other complex and difficult. We offer these illustrations as primitive attempts to think with eco-ethics about media technologies.

Magazines

By the end of the 20th century, "the pulp and paper industry was the second largest consumer of energy" in the U.S. (Independent Press Association et al., 2001, p. 6). The Southern states comprised the "largest paper-producing region in the world" (Wear & Greis, 2001). The pulp and paper industry became "the single largest consumer of water used in industrial activities in the wealth democracies of the [Organization for Economic Co-Operation and Development] OECD and the third largest greenhouse gas emitter, after the chemical and steel industries" (OECD, 2001, p. 218). Per capita paper consumption declined somewhat between 2000 and 2005, especially in the European Union, causing some paperless-society boosters to predict the ultimate passing of paper-based media — a vision that discounts the rapid growth of paper consumption in China and other developing countries and ignores the problems of increased energy consumption from the technologies replacing paper (scanners, charging cameras and laptops, etc.) (Fairfield, 2008). Moreover, claims that vital or cherished content can be permanently stored on hard drives and other media are proving to be fragile. According to the Academy of Motion Picture Arts and Sciences study, "The Digital Dilemma," there are good grounds both to doubt the long-term viability of storage media (they disintegrate or become obsolete faster than older media of paper and film) and to raise significantly the cost estimates of transferring content from one generation of storage media to the next, as well as the long-term energy commitments to support electronic storage model (Cieply, 2007).

Paper Production in Selected Nations 1998

Source: Hassan et al., 2005, p. 435

Paper consumption will continue to pose a core eco-ethical challenge to media studies. At least one paper-based medium offers a clear case of needless over-consumption: high-end commercial magazines. Since 2000, magazine publishing has been eating up forests at a rate higher than any other print medium—the glossier the magazine, the more new, or virgin wood is needed. By that year, 18,000 magazine titles were published annually in the U.S., which added up to an estimated annual print run of 12 billion copies, the equivalent of more than 35 million trees. Two-thirds of all copies are not purchased, leaving 90% to be trashed within a year of publication, of which just 19% are recycled. The rest, about two million tons, ends up in landfills or incinerators. This wasteful business is perpetuated by wholesale distributors, market research firms, and retail sellers who have no incentives for comprehending the meaning of sustainable publishing (Independent Press Association et al., 2001, pp. 5-10).

Annual Environmental Impact of the Production of 12 Billion Magazines

Environmental Impact	Annual Amount	Annual Equivalent
Wood Use	5,110,398 tons	Amount of copy paper used by 109 million people (39% of U.S. population)
Energy Use	72,220,086 million British Thermal Units	Enough to power 694,000 households
Greenhouse Gases (CO ₂ Equivalents)	13,408,395,941 pounds	As much as the emissions produced by 1.2 million cars
Solid Waste	4,917,979,277 pounds	As much as the garbage produced by 1.2 million households
Wastewater	34,241,543,545 gallons	As much as the sewage produced by 352,000 households
Particulate Emissions	23,572,856 pounds	N/A

Source: Alliance for Environmental Innovation/Environmental Defense, cited in Independent Press Association et al., 2001, p. 6.

The economic context of magazine publishing shows that the business model—overproduction—fails to address the limits of growth of publishing. With annual revenue increases of 1 to 2% in this sector (Wheaton, 2007, p. 14), advertisers get squeamish at any fluctuations in magazine circulation and threaten to abandon magazines altogether—though this is not unheard of as a ploy to hammer advertising rates down, especially when the money is really still being made in print ad spending, not on-line (“Out of Vogue,” 2007).

For ecocentric and intermediate eco-ethics, little time would be spent weighing the Earth’s well-being against a human-centered value derived from the “pleasing characteristics of magazines—their

portability and glossiness" ("Out of Vogue," 2007). This glossy medium in its current form would have to yield to the Earth. And our contribution? Media studies could introduce research on lifestyle and social organization to deepen the case against profligate deforestation, but the pressure must really come from the eco-crisis itself, which necessitates an immediate end to the existing papermaking process and disposal problem underpinning high-end commercial magazine publishing. Even "light-green" eco-ethics could find common ground for action here, but once drawn into the risk managerialism of CBA, environmentalists might find themselves compromising for an ecologically unsound outcome. Alternative sources of pulp could replace virgin forests (recycling, hemp, etc.), but would not provide the quality of paper currently used by the magazine industry. And as we've pointed out, electronic alternatives are not problem-free. The point of this illustration is to introduce an eco-ethical challenge that media studies could help resolve given its knowledge base and resources for research and analysis of this medium and its markets. From our point of view, gloss may be desirable, but it must be dispensable; forests transcend that calculus.

Cell Phones

The cell phone is a very compelling media technology. As Castells et al., (2007, pp. 246-258) argue, it is used by hundreds of millions of people worldwide. It's the technology of choice for developing countries trying to overcome internal "connectivity gaps." Mobiles outnumber landline phones, and they provide tools for youth culture and social networks. Their uses are malleable, multimedia, and multi-modal. They broaden channels of communication within a realm of personal safety, coordinate fragmented family life, improve individuals' experience ("choice") of peer groups, speed up rendezvous, and make users feel important. Moreover, there are additional features: users produce content, create their own language, and draw important meanings from the exterior design.

On the downside, however, there are many drawbacks: cell phones cause a new form of inequality (lack of access to the new sociality), are biased toward young eyes and dexterous fingers, can spread rumors quickly, are vulnerable to viruses, distract drivers and pedestrians, cause interpersonal conflicts between callers, and so on. Dan Schiller (2007, pp. 162-173) offers a contrasting view of mobile telephony, from a political-economic perspective. He challenges cell phone enthusiasts to query the way social stresses are not merely fueling new consumer needs, but are exploited at the expense of consumers who rush to buy inferior services at high cost. This is particularly the case in the U.S., where the decline in government oversight of telecommunication industries since World War II has resulted in increasing privatization, with diminishing emphasis on quality guarantees, standards, and regulation of competition. Schiller argues that poor-quality service in the U.S. is a function of these companies' abilities to exploit a social need for connectedness in times of social fragmentation. He draws on Raymond Williams' analysis of TV in the 1970s to describe the experience of displacement and deracination in modern life that settled into a mode of sociality in which individualization (separateness and privacy) combined with mobility (transportation and widening access to the world). Williams suggested the term "mobile privatization" to capture the paradoxical feelings of being at once more separated from others and more capable of connecting with them. Whereas broadcast technology, in Williams' view, was a social product of this industrial form of sociality (1975, p. 26), much like Castells et al.'s suggestion that mobile technology fits an analogous structure of feeling in the network society (timeless time, space of flows), Schiller argues

that political-economic arrangements allowed mobile telephony to emerge in a form befitting divided societies. In the U.S., telecommunications and postal services responded to this vulnerability under the guidance of public policy shaped in the public interest. The Internet and mobile telephony, by contrast, arrived in the U.S. under market criteria that privileged mobile privatization, and the fragmented forms of sociality from which it originated. They were exploited for profit, and their technical basis was inferior to Asian and European counterparts.

These two studies offer substantive analyses of lifestyle and organizational factors that have fueled the growth of mobile phone technology. Eco-ethics shifts the scholastic perspective to the reality of the eco-crisis and redirects analysis first to the ecological context of the cell phone: the production chain, life-cycle energy requirements, raw materials (source functions), environmental outputs (sink functions), or post-consumer existence (spent batteries, disposal, recycling, and so on). We can fill in certain airbrushed absences from this picture.

The source materials used in cell phones vary among manufacturers—but all contain lead and other heavy metals (circuit boards), frequently at levels that exceed U.S. toxicity standards (keep in mind the allocation of risk behind the notion of “safe amounts”). All involve chemical processing associated with chip production, including many toxic detergents and etchants; most contain mercury (screens) and flame retardants made of polybrominated diphenyl ethers (bioaccumulative synthetic chemical compounds are persistent organic pollutants known to cause neurological problems, though they are still not well-understood); all contain tantalum, the mining of which has caused “disastrous” social and environmental harm in Africa; and all contain batteries (Grossman, 2006, pp. 18-20, 44-45, and chap. 5). Compounds in batteries are toxic (among the substances they house are nickel-cadmium, lead-acid, nickel metal-hydride, lithium-ion, and lithium-polymer components). Like generators, batteries are not primary-energy sources, but instead require energy inputs prior to production and distribution and during recharging (including the “no-load” burden of plugged, but empty chargers) (Rydh, 2003). And additionally, results of recent research on long-term handset usage have confirmed links between brain tumors and radiation from mobile phones, causing the European Environment Agency to call for design changes (Lean, 2008). Cell phones do dread post-consumption work: about 130 million cell phones are trashed each year in the U.S. alone (with an estimated half billion old phones sitting in drawers), and Americans now purchase replacements every 12 months on average (Crosby, 2007; Mooallem, 2008, pp. 40-41). As one environmental health scientist warned: “In a phone that you hold in the palm of your hand, you now have more than 200 chemical compounds. To try to separate them out and study what health effects may be associated with burning or sinking it in water—that’s a lifetime of work for a toxicologist” (quoted in Mooallem, 2008, p. 42).

Clearly, manufacturers could help reduce environmental burdens by looking for non-toxic source materials, while manufacturers and distributors could help with buyback or recycling programs to keep spent phones and batteries out of landfills, as per 2006 legislation in California—not merely consumer/user refunctioning outlined in Castells et al. (2007). Nevertheless, progress in this policy area has been hampered by cost-benefit-analysis rigmarole (the current impasse in New York City government provides a good case study on the limits of “light green” approaches to the eco-crises) (“One Small Step

for Electronic Waste," 2008). Policy matters aside, what might media studies say about this very complex ethical challenge?

Ecocentrists would have us remember that the eco-crisis demands immediate termination of all unsound ecological practices associated with the cell phone, letting the Earth's well-being take precedence over the human good. Intermediate eco-ethics would press into this argument calls for action to stem the body and environmental burden of cell phone manufacturing, use, and disposal—studies of persistent organic pollutants in land, air and water would accompany epidemiological research to help guide solutions. And anthropocentric ecoethicists would have a range of responses, from calls for immediate application of the precautionary principle to applications of CBA that would settle for compromises and slow reforms to ensure greater technological efficiency in the manufacture and disposal of the cell-phones (with risks distributed along existing lines of stratification). The dilemma here is clear and the issues are daunting, but it's time for media and communication studies to intervene in this ecological challenge, interrogating our own investments in the technological sublime then deploying our critical skills to reassess the role of the media in shaping the environment. We believe that eco-ethics is a good point of departure for this endeavor, especially when it is linked to domains of knowledge and activism that are already important to our field, such as feminism, which can be articulated to environmental feminism, and critical race theory, articulated to environmental justice (Pellow & Park, 2002).

We have introduced the possibility of an eco-ethics in the field. Our ideas are raw and contestable. We recognize that media and communication studies do not suffer from complete "technological somnambulism" (Winner, 1986); but the field contributes to the enchantment of media technologies and the disenchantment of non-human nature. To that extent, we either do nothing about the eco-crisis, or even enable it. We think this has to end.

References

- "Avian/Communication Tower Collisions." (September 30, 2004). Prepared for Federal Communications Commission by Avatar Environmental, Llc, West Chester, Pa.
- "CEA Forecasts Consumer Electronics Revenue will Surpass \$155 Billion in 2007." (2007, January 6). Consumer Electronics Association.
- "Gartner Estimates ICT Industry Accounts for 2 Percent of Global CO2 Emissions." (2007, April 26). <gartner.com/it/page.jsp?id=503867&format=print>.
- "One Small Step for Electronic Waste." (2008, March 15). *New York Times*: A18.
- "Out of Vogue." (2007, September 29). *Economist*: 72-3.
- Allen, Stuart. (2002). *Media, Risk and Science*. Buckingham: Open University Press.
- Aslama, Minna, Siira, Kalle, Rice, Ronald, Aula, Pekka Aula with Napoli, Philip & Pearce, Katy. (2007). *Mapping Communication and Media Research in the U.S.*. Communication Research Centre, Department of Communication, University of Helsinki.
- Bar, François with Simard, Caroline. (2006). "From Hierarchies to Network Firms." *The Handbook of New Media: Updated Students Edition*. Ed. Leah Lievrouw and Sonia Livingstone. Thousand Oaks: Sage. 350-63.
- Barnouw, Eric. (1990). *Tube of Plenty*, 2nd ed. New York: Oxford University Press.
- Basel Action Network and Silicon Valley Toxics Coalition. (2002). *Exporting Harm: The High-Tech Trashing of Asia*.
- Briggs, Asa & Burke, Peter. (2003). *A Social History of the Media: From Gutenberg to the Internet*. Cambridge: Polity.
- Broad, William J. (2007, July 31). "NASA Forced to Steer Clear of Junk in Cluttered Space." *New York Times*: F4.
- Callicott, J. Baird. (1994). *Earth's Insights: A Multicultural Survey of Ecological Ethics from the Mediterranean Basin to the Australian Outback*. Berkeley: University of California Press.
- Carey, James. (2003). "The Internet and the End of the National Communication System." *Television: Critical Concepts in Media and Cultural Studies Volume 5*. Ed. Toby Miller. London: Routledge. 185-93.
- Carmichael, Deborah A. (2006). *The Landscape of Hollywood Westerns: Ecocriticism in an American Film Genre*. Salt Lake City: University of Utah Press.
- Castells, Manuel, Fernández-Ardèvol, Mireia, Qiu, Jack Linchuan & Sey, Arab. (2007). *Mobile Communication and Society: A Global Perspective*. Cambridge, Mass.: MIT Press.
- Castells, Manuel. (1996-1998). *The Information Age: Economy, Society, and Culture* Vols. I-III. London: Blackwell.

- Castells, Manuel. (1997). *The Power of Identity. The Information Age: Economy, Society, and Culture Volume II.*
- Cieply, Michael. (2007, December 23). "The Afterlife is Expensive for Digital Movies." *New York Times*: Sunday Business Section 6.
- Clowney, Stephan. (2006). "Environmental Ethics & Cost Benefit Analysis." *Fordham Environmental Law Review* 18: 105-50.
- Connolly, William. (2005). *Pluralism.* Durham: Duke University Press.
- Corbett, Charles J. & Turco, Richard P. (2006, November). *Sustainability in the Motion Picture Industry.* Report prepared for the Integrated Waste Management Board of the State of California. Available at: http://personal.anderson.ucla.edu/charles.corbett/papers/mpis_report.pdf. See also <http://personal.anderson.ucla.edu/charles.corbett/mpis.htm>.
- Cox, Stan. (2007, July 31). "Are Your Cell Phone and Laptop Bad for Your Health?" *AlterNet*. <www.alternet.org/healthwellness/58354/?page=1>.
- Cubitt, Sean. (2005). *Eco Media.* Amsterdam/New York: Editions Rodopi.
- Curry, Patrick. (2006). *Ecological Ethics: An Introduction.* Cambridge: Polity Press.
- Dalton, Russell J. (2005). The Greening of the Globe? Crossnational Levels of Environmental Group Membership. *Environmental Politics* 14, no. 4: 441-59.
- Daly, Herman E. (1996). "'Sustainable Growth?' No Thank You." *The Case Against the Global Economy.* Ed. Jerry Mander and Edward Goldsmith. San Francisco: Sierra Club Books. 192-96.
- Dean, Hartley. (2001). "Green Citizenship." *Social Policy & Administration* 35, no. 5: 490-505.
- Deutsch, Claudia H. (2007, December 25). "A Threat So Big, Academics Try Collaboration—Disciplines Cross Lines to Fight Global Warming." *New York Times*: C1.
- Dinerstein, Joel. (2006). "Technology and Its Discontents: On the Verge of the Posthuman." *American Quarterly* 58, no. 3: 569-95.
- Dobson, Andrew. (2003). *Citizenship and the Environment.* Oxford: Oxford University Press.
- Douglas, Susan. (1989). *Inventing American Broadcasting, 1899-1922.* Baltimore: The Johns Hopkins University Press.
- Ellis, John. (2007). *TV FAQ: Uncommon Answers to Common Questions About TV.* London: IB Tauris.
- Engardio, Pete with Cappell, Kerry, Carey, John, & Hall, Kenji. (2007, January 29). "Beyond the Green Corporation." *Business Week*, Issue 4019: 50-64.
- Engels, Frederick. (1892). *The Condition of the Working Class in England in 1844.* London: S. Sonnenschein & Co. This was first UK edition. First German edition published in 1845. American edition published in 1887.
- Environmental Protection Agency. (2007). *Management of Electronic Waste in the United States.*

- Fairfield, Hannah. (2008, February 10). "Pushing Paper out the Door." *New York Times*: Sunday Business Section 1.
- Garnham, Nicholas. (2005). "From Cultural to Creative Industries: An Analysis of the Implications of the "Creative Industries" Approach to Arts and Media Policy Making in the United Kingdom." *International Journal of Cultural Policy* 11, no. 1: 15-29.
- Grossman, Elizabeth. (2006). *High Tech Trash: Digital Devices, Hidden Toxics, and Human Health*. Washington: Island Press.
- Hassan, Rashid, Scholes, Robert, & Ash, Neville, eds. (2005). *The Millennium Ecosystem Assessment Series: Current State and Trends, Volume 1. Findings of the Condition and Trends Working Group of the Millennium Ecosystem Assessment*. Washington: Island Press.
- Hochman, Jhan. (1998). *Green Cultural Studies: Nature in Film, Novel, and Theory*. University of Idaho Press.
- Hopgood, Stephen. (1998). *American Foreign Environmental Policy and the Power of the State*. New York/London: Oxford University Press.
- Hundt, Reed & Rosston, Gregory L. (2006). "Communications Policy for 2006 and Beyond." *Federal Communications Law Journal* 58: 1-34.
- Independent Press Association, Conservatree, and Co-op America. (2001). *Turning the Page: Environmental Impacts of the Magazine Industry and Recommendations for Improvement*.
- Ingram, David. (2000). *Green Screen: Environmentalism and Hollywood Cinema*. U.K.: University of Exeter Press.
- Korten, David C. (1996). "The Failures of Breton Woods." *The Case Against the Global Economy*. Ed. Jerry Mander and Edward Goldsmith. San Francisco: Sierra Club Books. 20-30.
- Latour, Bruno with Kastrissianakis, Konstantin. (2007, March 22). "We are All Reactionaries Today." *Re-Public: Re-Imagining Democracy—English Version*<www.re-public.gr>.
- Lean, Geoffrey. (2008, March 30). "Mobile phones 'more dangerous than smoking'." *Independent*. <independent.co.uk/life-style/health-and-wellbeing/health-news>
- Lee, Sherry. (2002, May 12). "Ghosts in the MACHINES." *South China Morning Post Magazine*.
- Leopold, Aldo. (1949). *A Sand County Almanac*. New York: Oxford University Press.
- Leung, Anna O. W., Nurdan S. Duzgoren-Aydin, Cheung, K.C. & Wong, Ming H. (2008). "Heavy Metals Concentrations of Surface Dust from e-Waste Recycling and Its Human Health Implications in Southeast China." *Environmental Science and Technology*, 42(7): 2674-2680.
- Linden, Greg, Kraemer, Kenneth L. & Dedrick, Jason. (2007). "Who Captures Value in a Global Innovation System? The Case of Apple's iPod." Personal Computing Industry Center, Alfred P Sloan Foundation Industry Center, Paul Merage School of Business, University of California, Irvine.

- McLaughlin, Andrew. (1993). *Regarding Nature: Industrialism and Deep Ecology*. Albany: State University of New York Press.
- Macauley, David. (1996). "Hanna Arendt and the Politics of Place: From Earth Alienation to *Oikos*." In David Macauley, ed., *Minding Nature: The Philosophers of Ecology*. New York: The Guilford Press.
- Marvin, Carolyn. (1988). *When Old Technologies Were New: Thinking About Electronic Communication in the Late Nineteenth Century*. New York: Oxford University Press.
- Maxwell, Richard & Miller, Toby. (in press). "Green Smokestacks?" *Feminist Media Studies*.
- Michaelson, Jay. (1996). "Rethinking Regulatory Reform: Toxics, Politics, and Ethics." *Yale Law Journal* 105, no. 7: 1891-925.
- Miller, Toby. (2007a). *Cultural Citizenship: Cosmopolitanism, Consumerism, and Television in a Neoliberal Age*. Philadelphia: Temple University Press.
- Miller, Toby. (2007b, December 16). "Face Up to Tech Waste." *Press-Enterprise* <http://www.pe.com/localnews/opinion/localviews/stories/PE_OpEd_Opinion_D_op_1216_miller_loc.1b11b81.html>
- Miller, Toby, Govil, Nitin, McMurria, John, Maxwell, Richard & Wang, Ting. (2005). *Global Hollywood 2*. London: British Film Institute.
- Mosco, Vincent. (2004). *The Digital Sublime*. Cambridge, Mass.: MIT Press.
- Mooallem, Jon. (2008, January 13). "The Afterlife of Cellphones." *New York Times*: 38-43.
- Noble, David F. (1977). *America by Design: Science, Technology and the Rise of Corporate Capitalism*. Oxford: Oxford University Press.
- Nye, David E. (2006). "Technology and the Production of Difference." *American Quarterly* 58, no. 3: 597-618.
- O'Malley, Pat. (2001). "Discontinuity, Government and Risk: A Response to Rigakos and Hadden." *Theoretical Criminology* 5, no. 1: 85-92.
- OECD. (2001). *Environmental Outlook*.
- Parks, Lisa. (2007). "Falling Apart: Electronics Salvaging and the Global Media Economy." In Charles Acland, ed., *Residual Media*. Minneapolis: University Of Minnesota Press, 32-47.
- Pellow, David Naguib & Park, Lisa Sun-Hee. (2002). *The Silicon Valley of Dreams: Environmental Justice, Immigrant Workers, and the High-Tech Global Economy*. New York: New York University Press.
- Pelta-Heller, Zack. (2007, October 29). "HP's Printer Cartridges are an E-Waste Disaster—Does the Company Really Care?" *AlterNet*.

- Pepper, David. (2000). "Environmentalism." In Browning, G., Halci, A., and Webster, F., editors, *Understanding Contemporary Society: Theories of the Present*. London: Sage Publications, 445-462.
- Political Economy Research Institute. (2004). *The Misfortune 100: Top Corporate Air Polluters in the United States*.
- Pynchon, Thomas. (1984, October 28). "Is it O.K. to be a Luddite?" *New York Times Book Review*: 1, 40-41.
- Rigakos, George S. & Hadden, Richard W.. (2001). "Crime, Capitalism and the 'Risk Society'." *Theoretical Criminology* 5, no. 1: 61-84.
- Robins, Kevin & Webster, Frank. (1999). *Times of the Technoculture: From the Information Society to the Virtual Life*. London: Routledge.
- Rose, Deborah B. & Robin, Libby. (2004). "The Ecological Humanities in Action: An Invitation." *Australian Humanities Review* Issue 31-32, April. Available at www.lib.latrobe.edu.au/AHRarchive/issue-April-2004/rose.html
- Rydh, Carl Johan. (2003). *Environmental Assessment of Battery Systems: Critical Issues for Established and Emerging Technologies*. Thesis: Department of Environmental Systems Analysis, Chalmers University of Technology. Göteborg.
- Schaefer, Peter D. & Durham, Meenakshi Gigi. (2007). "On the Social Implications of Invisibility: The iMac G5 and the Effacement of the Technological Object." *Critical Studies in Media Communication* 24, no. 1: 39-56.
- Schiller, Dan. (2007). *How to Think About Information*. Urbana: University of Illinois Press.
- Schoenfeld, Amy. (2007, December 22). "Everyday Items, Complex Chemistry." *New York Times*: C9.
- Shabi, Rachel. (2002, November 30). "The E-Waste Land." *Guardian*.
- Silicon Valley Toxics Coalition (n.d.). "Electronics Lifecycle: A Wake of Unintended Collateral Damage from Cradle to Coffin." Available at:
http://www.etoxics.org/site/PageServer?pagename=svtc_lifecycle_analysis
- Starr, Paul. (2004). *The Creation of the Media: Political Origins of Modern Communications*. New York: Basic Books.
- Sterling, Christopher H. & Kittross, John Michael. (2002). *Stay Tuned: A History of American Broadcasting*, 3rd ed. Mahwah: Lawrence Erlbaum.
- Sterne, Jonathan. (2007). "Out with the Trash: On the Future of New Media." In Charles Acland, ed., *Residual Media*. Minneapolis: University Of Minnesota Press, 16-31.
- Tong, Xin & Wang, Jici. (2004). "Transnational Flows of E-Waste and Spatial Patterns of Recycling in China." *Eurasian Geography and Economics* 45, no. 8: 608-21.

Twist, Jo. (2005, January 10). "Gadget Market 'to Grow in 2005'." *BBC News*.

van Loon, Joost. (2008). *Media Technology: Critical Perspectives*. Maidenhead: Open University Press.

Wald, Matthew L. (2007, November 7). "Taming the Guzzlers that Power the World Wide Web." *New York Times*: H7.

Wear, David N. & Greis, John G. (2001). *The Southern Forest Resource Assessment Summary Report*. USDA Forest Service.

Williams, Raymond. (1975). *Television: Technology and Cultural Form*. New York: Schocken Books.

Winner, Langdon. (1986). *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. University of Chicago Press.

Winston, Brian. (1998). *Media Technology and Society: A History from the Telegraph to the Internet*. London: Routledge.

Wong, Coby S. C., Wu, S. C., Duzgoren-Aydin, Nurdan S., Aydin, Adnan, & Wong, Ming H. (2007). "Trace Metal Contamination of Sediments in an E-Waste Processing Village in China." *Environmental Pollution* 145: 434-42.