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Media Ecology and Value Sensitive Design:

A Combined Approach to Understanding the Biases of Media Technology

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In recent years, a field known as *value sensitive design* has emerged to identify, understand, anticipate, and address the ethical and value biases of media and information technologies. Upon developing a dialectical model of how bias exists in technology, this paper makes a case for the dual relevance of value sensitive design to media ecology. I argue that bringing the two approaches together would be mutually beneficial, resulting in richer investigations into the biases in media technologies.

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In his book *Technopoly*, Neil Postman (1992) remarked how "we are surrounded by the wondrous effects of machines and are encouraged to ignore the ideas embedded in them. Which means we become blind to the ideological meaning of our technologies" (p. 94). It has been the goal of many scholars of media technology to remove these blinders and critically explore the ideological biases embedded within the material forms of media technologies. This endeavor forms the foundation of *media ecology*, an approach to studying media technology that Postman helped to establish. The goal of media ecological scholarship is to uncover and understand "how the form and inherent biases of communication media help create the environment . . . in which people symbolically construct the world they come to know and understand, as well as its social, economic, political, and cultural consequences" (Lum, 2000, p. 3). Examples include the rich technological histories of Harold Innis (1951), Lewis Mumford (1934), and Elizabeth Eisenstein (1979, 1983); the probes on the social and cultural impact of the emergence of information technology by Jacques Ellul (1964), Marshall McLuhan (1962, 1964/1994), and Neil Postman (1985, 1992); and more recent work focusing on the ecological impact of new, digital media technology by numerous scholars, including Paul Levinson (1997, 1999), Lev Manovich (2001), and Sherry Turkle (1995).

These scholars, indeed all media ecologists, understand that the impact of technology is not benign. Media and information technologies are not neutral; they tend to promote certain ideologies, while obscuring others. In short, media technologies have biases. As Christine Nystrom (personal communication, September 2002), a longtime colleague of Postman, summarizes, "Because of their differences in physical and symbolic form, and the resulting differences in their intellectual, emotional, temporal, spatial, political, social, metaphysical, and content biases, different media have different epistemological biases."

What is often overlooked and missing from Nystrom's list is how media and information technologies also have *ethical* and *value* biases. Outside the media ecology tradition and within the halls of engineering and computer science, there has been increasing interest in and concern with the value implications of information technologies, a perspective commonly referred to as

value sensitive design. This emerging discipline recognizes how information and communication technologies act as crucial media for asserting social, political, ethical, and moral values. The goal of this paper is to map the intersections between media ecology and value sensitive design and show how employing both approaches can enrich our understanding of how media technologies contain biases.

To begin, however, we must first understand how technologies contain biases. The first part of the paper discusses three theories of how biases might exist in technologies and ends by revealing a dialectical relationship between these three seemingly incompatible theories. The second part provides a definition of a media ecological approach to understanding biases in media technologies, using Harold Innis, Walter Ong, and Elizabeth Eisenstein as our guides. The concern that media ecology suffers from media determinism is also discussed. Value sensitive design is introduced next and its unique contributions to the study of biases in technologies are outlined. In all, this paper makes a case for the relevance of value sensitive design to media ecology and argues that bringing the two approaches together would be mutually beneficial, resulting in richer investigations into the biases of media technologies.

How Technologies Have Biases

BEFORE discussing media ecological and value-based approaches to investigating how media embody particular biases, we must understand how such biases become implicated in technologies in the first place. Three theories can be identified: embodied, exogenous, and interactional (see Friedman & Kahn, 2003).

The Embodied Theory

WHILE we often think our technologies are shaped only by concern for efficiency or other technical considerations, the embodied theory suggests that, in fact, many technologies are designed as a reflection of the biases of their inventors. A frequently cited example of bias embodied in technology is the design of the Long Island Highway. Robert Moses, the urban planner responsible for much of modern New York City, built the overpasses over the Long Island Highway only nine feet high, thereby allowing only single-family automobiles to navigate the parkway. The city's poor and minority classes, largely dependent on public buses for transportation, could not drive along the highway and were essentially denied access to the beachfront destinations. This design decision is often credited to Moses's prejudice against minorities and his desire to keep them from the beaches and enclaves of outer Long Island (see Winner, 1986). This technological system—the architecture of the highway—is embedded with the particular bias of its creator.

The embodied theory of technological bias also maintains that once certain biases are designed into a technology, the resulting artifact determines specific kinds of human behavior or cultural effects. In the above example, the design of the highway determined the (in)ability for minorities to travel outside New York City. This position most resembles the thesis of technological determinism that posits that social, cultural, political, and economic aspects of our lives are to a large degree determined by technology.[1] Smith (1994) warns, however, that such technologically deterministic thinking can be "alluring but dangerous" (p. 35). To help avoid this danger, he suggests two levels of technological determinism—hard and soft. Hard determinism sees technologies as the single cause of social change and the biases that inventors bring to their tasks inevitably become part of the technologies; this is nearer to the embodied theory of how

technologies have biases. The soft view, however, holds that while technological change might influence social change, it also responds discriminatingly to social pressures. Soft determinism, then, places technology within a complex social, economic, political, and cultural matrix. This softer version of technological determinism opens the door to the second explanation of how biases exist in technologies: the exogenous theory.

The Exogenous Theory

An exogenous theory of technology argues that outside social forces significantly shape how a technology is designed, deployed, and used. In this theory, bias is not embedded in a technology by its inventor, resulting in specific and inevitable social consequences. Rather, the exogenous theory holds that technological bias emerges as a result of the social shaping of the technology, often beyond the influence or control of the original designer. This theory resembles the position of many scholars who study the *social construction of technology* (SCOT) (see Pinch & Bijker, 1987; Bijker, 1995; Bijker & Law, 1992). Such theorists argue that technologies are constructed through a process of strategic negotiation between different social groups, each often pursuing its own specific interests. The key idea underlying the theory of SCOT and in exogenous theories of technological bias is that social arrangements create, shape, and determine the design of technologies, how they are used, and what biases they contain.

An example of the application of the exogenous theory of technology is Pinch and Bijker's (1987) account of the design of early bicycles. Pinch and Bijker reveal how initially there was great flexibility and variability in bicycle design, with many alternative technologies being available for adoption, each with its own technological bias (some designs favored speed and aggressiveness, others safety; certain designs were amenable for female riders, while others made riding while wearing a dress impossible; and so on). Over time, a process of selection and winnowing out of the various designs took place, until large constituencies within the users of the bicycle (what Pinch and Bijker call relevant social groups) eventually agreed on the purpose, meaning, and physical form of the technology. Pinch and Bijker's analysis exemplifies the exogenous theory of technological bias: the bicycle emerged through the interaction between various sociocultural influences, not through some inevitable path of linear technological evolution. Similarly, the biases within the resulting design were not embedded by some prejudiced inventor, but were shaped by the negotiations and interactions between numerous social groups over the course of the technology's development.

The Interactional Theory

The third theory of how technologies might contain biases focuses on the idea of "technology-in-practice." Acknowledging that the features and biases of a technology are in part the result of the original design (embodied theory) and shaped by social forces (exogenous theory), this interactional theory of technology holds that a technology's biases result primarily from its *use*, from the goals and biases of the people interacting with it. The difference between the exogenous theory and the interactional is subtle, but important. While the exogenous theory reveals how the interactions between various social groups help shape a technology, it remains focused on a technology's *formation*, which eventually ends in a stabilization of the design of the artifact. The interactional theory, on the other hand, recognizes that a technology rarely reaches such a state of closure and, instead, changes over time through human interaction. Technologies might be designed for particular uses, but they are then constantly appropriated and

redesigned based on user interactions with the artifacts, which are then *again* interacted with and re-redesigned, and so on. Thus, in this technology-in-practice conceptualization of technological design, the bias of a technology both emerges as a result of the interactions between a technology and its users and can potentially be resisted and reformulated through these very interactions.

An example of the interactional theory at work is the history of the Internet (see Abbate, 1999; Hafner & Lyon, 1998). The Internet's roots lie within the Advanced Research Projects Agency Network (ARPANET) project sponsored by the U.S. Department of Defense in the 1960s. The motivations for the creation of the ARPANET were twofold: to create a data communications network with sufficient robustness and survivability to withstand losses of large portions of the underlying networks, and to link mainframe computers at scientific laboratories and universities across the country so that researchers might share computer resources. The resulting distributed computer network met these goals, and ARPANET was activated in 1969.

While the ARPANET was initially restricted to military, university, and other large research sites, it was mostly run and maintained by the cheapest and most available labor source: computer science graduate students. Once taken out of the hands of the career system administrators and network managers, the usage—and eventually the architecture—of the network changed. In the minds of its inventors, the ARPANET was intended for resource-sharing and high-level data communications robustness for government and military purposes. But for the graduate students who interacted with the network on a daily basis, it became essentially an interpersonal messaging system—a communication technology. Computer chat and e-mail programs quickly emerged. Protocols and functions were written to facilitate human communication and interaction. As the network grew in size and more people interacted with it, the technology converged with "the torrential human tendency to talk" (Hafner & Lyon, 1998, p. 189). From an interactional theory perspective, then, the technology of the ARPANET was being redesigned through its interaction with different categories of users. The original bias towards resource-sharing and government data communications was shifted toward a design bias focused on a communication infrastructure to maximize human interaction.

The Three Theories: A Dialectical Model

As with most categorizations of complex ideas, my conceptualization of these three theories of how technologies have biases is not exhaustive. The theories are not necessarily mutually exclusive and are not put forth as airtight metaphysical divisions. They are meant simply to bring unruly ideas under control and, in fact, can be systematically related in the sense of a Hegelian dialectic (see Singer, 1995, p. 342). In Hegel's usage, a dialectic consists of three stages: a thesis, an antithesis that contradicts or negates the thesis, and a synthesis embodying what is essential to each. The three theories of technology I have outlined can be mapped onto a similar dialectical path: the embedded theory represents the thesis, arguing that biases are embedded in the technology at the moment of invention, with direct and deterministic social effects; the exogenous theory is the antithesis, insisting that the negotiation of complex social forces shape a technology and its resulting biases, and its social effects cannot be pre-determined; the synthesis, then, is the interactional theory, which acknowledges the biases and intentions in the original design of a technology, but also asserts that a continual re-shaping of the technology occurs though its interaction with the social practices of its users. When considered in this manner, the three theories provide a unique dialectical model of how technologies have biases.

With this understanding of how technologies might contain biases and armed with a unique dialectical model, we can now turn our attention to how the media ecology tradition investigates the biases of media technologies.

Biases in Media Technologies: The Media Ecological Approach

What is Media Ecology?

MEDIA ecology is an interdisciplinary field studying the intersections between media, communication, technology, and culture, and enjoys a rich tradition of examining biases in media technologies. Inspired by the provocative theories of Marshall McLuhan, the idea of media ecology first emerged formally in an address by Neil Postman in 1968 in which he described it as "the study of media as environments," explaining that the main concern for media ecologists is "how media of communication affect human perception, understanding, feeling and value; and how our interaction with media facilitates or impedes our chances for survival" (Postman, 1970, p. 161). Postman later offered a more elaborate definition, summarizing the importance of the ecological metaphor:

> The word *ecology* implies the study of environments—their structure, content, and impact on people. An environment is, after all, a complex message system which regulates ways of feeling and behaving. It structures what we can see and say and, therefore, do. Sometimes, as in the case of a courtroom, or classroom, or business office, the specifications of the environment are explicit and formal. In the case of media environments (e.g., books, radio, film, television, etc.), the specifications are more often implicit and informal, half-concealed by our assumption that we are dealing with machines and nothing more. Media ecology tries to make those specifications explicit. It tries to find out what roles media force us to play, how media structure what we are seeing, why media make us feel and act as we do. (Postman & Weingartner, 1971, p. 139)

The fundamental goal for media ecology, then, is to understand how the forms and biases of our media technologies impact our everyday lives. The media ecological perspective on understanding the biases of media technologies is perhaps best illustrated through a series of assertions offered by Christine Nystrom (personal communication, September 2002):

1. Because of the different symbolic forms in which they encode information, different media have different intellectual and emotional biases.
2. Because of the different physical forms in which they encode, store, and transmit information, different media have different temporal, spatial, and sensory biases.
3. Because of the accessibility of the symbolic forms in which they encode information, different media have different political biases.
4. Because their physical form dictates differences in conditions of attendance, different media have different social biases.
5. Because of the ways in which they organize time and space, different media have different metaphysical biases.
6. Because of their differences in physical and symbolic form, different media have different content biases.
7. Because of their differences in physical and symbolic form and the resulting differences in their intellectual, emotional, temporal, spatial, political, social,

> metaphysical, and content biases, different media have different epistemological biases.

Media ecology explores how such biases are implicated in the media technologies that construct the world in which we live, as well as their social, economic, political, epistemological, and cultural consequences. As the following section will reveal, the work of Harold Innis, Walter Ong, and Elizabeth Eisenstein embody this media ecological objective.

Media Ecological Studies of Bias in Media Technologies

EXPLORATIONS of such biases of media technologies are found throughout the intellectual roots of the media ecological tradition. Harold Innis, a key scholar in the study of the social history of communication media, explores the linkages between media technology and the various forms of social structure found at certain points in history. In *The Bias of Communication*, Innis (1951) argues that the relative stability of a culture depends on the balance and proportion of its dominant media technology: "A medium of communications has an important influence on the dissemination of knowledge over space and over time and it becomes necessary to study its characteristics in order to appraise its influence in its cultural setting" (p. 33). He claims that each medium embodies a bias in terms of the organization and control of information; by examining the formal features of a culture's communication technologies, Innis reveals their distinctive sensory, cognitive, socio-political, and ideological biases.

Walter Ong is another scholar who examines the biases within media technologies from a media ecological lens. Focusing on the psychodynamics of orality and literacy, Ong (1982) documents the shift from oral modes of communication, consciousness, and culture associated with scribal culture towards a literate culture and its dominant visual and linear biases. Ong comments that because "we have by today so deeply interiorized writing, made it so much a part of ourselves . . . we find it difficult to consider writing to be a technology" (p. 82). He adds, "Freeing ourselves of chirographic and typographic bias . . . is probably more difficult than any of us can imagine" (p. 77).

Ong (1982) explores the effects of the technologizing of the word on human consciousness—the effects of the biases of print technology. By removing words from the world of sound, where they existed only in active human interchange, and relegating them to a fixed, definitive visual surface, print encouraged readers to think of their own interior conscious thoughts as possessions, something they owned, and "encouraged the mind to sense that its possessions were held in some sort of inert mental space" (p. 132). Print and literacy altered one's relationship to the text. Now, by reading privately in silence, with the thoughts separated from the message within one's head, the authority and meaning of the message could more easily be questioned. The text was alone, without the inter-personal context that orality thrived in. The reader of print, Ong argues, was encouraged to consider her conscious thoughts as possessions and gained greater ability to reflect on the text being read. The authority of orality was threatened, and the cultural conception of individuality with individual thoughts and beliefs was advanced. The technological biases of print inevitably affected not only the psychology of the persons within a culture but also the structure—the ecology—of the culture as a whole.

Elizabeth Eisenstein (1979, 1983) further investigates the technological biases of typography in her exhaustive study of the printing revolution, extending Ong's arguments about effects on consciousness to include cultural effects as well. Eisenstein reveals how the printing press altered the communication networks used by religious groups, learned communities, and governments throughout early modern Europe. The standardization and mass production of printed texts

encouraged the development of vernacular languages, along with standardized spelling and grammar, and typographic conventions such as paragraphing, headings, and footnotes. Eisenstein (1983) reveals how print altered methods of data collection, storage, and retrieval, ranging from cataloguing, cross referencing, and indexing, to the alphabetic organization of vast libraries (pp. 64-66). Revealing how the printing press changed the conditions under which information was collected, stored, retrieved, criticized, rediscovered, and promoted, Eisenstein maintains that the technological biases of the printing press had important consequences on the Renaissance, the Protestant Reformation, and science.

Media Determinism and the Dialectical Model of Technology

INNIS, Ong, and Eisenstein focus on the technological biases of media to gain a greater awareness of the role of technology in the shaping of human culture. This is an overarching thread in media ecological scholarship, exemplified by McLuhan's (1964/1994) assertion that "the medium is the message" (p. 7), that the technological bias of a medium carries greater importance than the particular message it is delivering. McLuhan saw changes in the dominant medium of communication as the main determinant of major changes in society, culture, and the individual. This McLuhanesque logic, which rests at the center of the media ecology tradition, is often criticized for its media determinism. Seeing the biases of media technologies as the primary force for social and cultural change resembles the hard technological determinism of the embodied theory of technological bias. The theories presented by Innis, Ong, and Eisenstein, then, could all be labeled as forms of hard media determinism—they indicate that social, cultural, political, and economic aspects of our lives are determined by the biases of the prevailing media technology.

However, benefiting from the unique dialectical relationship between the three previously discussed theories of how technologies have biases, this charge of media determinism among media ecologists can be softened. Media ecology is not committed to a strict embodied vision of biases in media technologies. Consider Eisenstein's treatment of the printing press. She positions the technological biases of the printing press alongside the rise of nationalism, inductive science, capitalism, individualism, and Protestantism; but she is cautious about assigning too strong a causal relationship between print and these cultural events. In fact, the title of the 1979 unabridged version of her text is, *The Printing Press as an* Agent [emphasis added] *of Change*, which recognizes that media technology is an agent of change, but not necessarily a first cause.

Eisenstein (1983) also presents a more interactional position regarding media technology and social change:

> I want to suggest that printing produced a mutation. . . . The relationship between a given technological and a given cultural change will be approached, not by taking them to coincide . . . but by acknowledging that they came at different times and by investigating how they affected each other. (pp. 114-115)

By acknowledging how technology and culture might affect one another, Eisenstein recognizes that it is often the interaction between a technology and its users that determine its impact. A close inspection of the media ecology tradition reveals broad commitment to this softer form of media determinism and a close alliance with the unique dialectical picture of how technologies have biases as described above. As Lum (2000) notes, "one of media ecology's major concerns [is] the complex *symbiotic* [italics added] relationship among the media and . . . between media and the various forces in society" (p. 1).

Media ecology, then, is not a one-dimensional approach to understanding the effects of media technology on society; it is not hard media determinism. Rather, it recognizes the complex relationship between media technologies and society, the systemic effects that media technologies have on our culture—it is the interaction between media technologies and human beings that is the subject of media ecology, and not the technologies themselves. As Strate (2004) summarizes, "media ecology itself is the product of human relationships" (p. 38). The media ecological study of the biases of media technologies remains fully compatible with the dialectical model of biases in technologies and overcomes the charge of media determinism.

Having illustrated the contribution of media ecology to understanding the biases in media technologies in a way that avoids the trap of hard media determinism, we can now turn our attention to the exploration of a particular set of biases commonly overlooked in media ecological scholarship: the ethical and value biases of media technologies.

Biases in Media Technologies: The Value Sensitive Design Approach

What is Value Sensitive Design?

In recent years, the multi-disciplinary field known as *value sensitive design* has emerged to identify, understand, anticipate, and address the ethical and value-laden concerns that arise from the rapid design and deployment of media and information technologies (see Friedman, 1997, 1999; Friedman & Kahn, 2003). Recognizing how technologies contain ethical and value biases, value sensitive design has this primary goal: to affect the design of technology to take account of human values during the conception and design process, rather than merely retrofit them after completion. Friedman and Kahn (2003) contend that 12 specific human values have ethical import that need to be considered in the design process: human welfare, ownership and property, privacy, freedom from bias, universal usability, trust, autonomy, informed consent, accountability, calmness, identity, and environmental sustainability.[2] In concert with the dialectical model of biases in technologies presented above, the fundamental underpinnings of value sensitive design recognize that technology both shapes society and is shaped by social factors; thus, complex sociotechnical systems that involve intertwined interactions between humans and technology cannot be designed in a value vacuum.

The formalized value sensitive design methodology consists of a three-pronged approach, which includes investigations of conceptual, empirical, and technical issues specific to a particular design (Friedman & Kahn, 2003). The conceptual investigation consists of an analysis informed by the philosophy of those value constructs relevant to the design in question. The conceptual investigation focuses on how the value subsets from the aforementioned 12 primary human values are either supported or diminished by a particular design. For example, in the design of a system that monitors employee use of the Internet and e-mail, the human values of privacy and informed consent are central ethical issues that need to be addressed in the design and implementation of the monitoring system.

The second phase of value sensitive design is empirical investigation, which focuses on quantitative and qualitative measurements to evaluate the design from both a technical and value assessment approach. This phase is designed to conduct social scientific research involving experiences of people, which include individuals, groups, and organizations. A primary consideration in this phase of analysis is investigating how design tradeoffs affect perceptions, behaviors, and prioritization of competing values and, furthermore, how the designer can support or detract from value conflict.

The last phase of the value sensitive design approach concerns the investigation of technical issues. In this phase, technical designs are analyzed to assess how they support particular values and how values identified in the conceptual investigation could be best supported by different design possibilities. While the technical and empirical investigations seem similar, they are different in that the technical phase focuses on the technology while the empirical phase focuses on the human interaction with the technology. Because value sensitive design is an iterative process, one phase of either technical or empirical investigation will inform the other, and empirical investigation is critical to both identify and confirm technical design issues.

Recently, explorations into the intersections of human values and media technologies have become both increasingly visible and fruitful. For example, the human-computer interaction community has maintained a strong commitment to examining and/or designing computer systems and user-interfaces that support human values (Shneiderman, 1991, 1998; Raskin, 2000). Other scholarship includes the design implications of such values as privacy (Agre & Rotenberg, 1998; Nissenbaum, 1998), trust (Nissenbaum, 2001), autonomy (Friedman & Nissenbaum, 1997; Winograd, 1994), and freedom from bias (Friedman & Nissenbaum, 1996). Additionally, various research initiatives, [3] along with numerous academic courses, [4] have emerged that are dedicated to value sensitive design.

Uniqueness of Value Sensitive Design

WHAT, then, distinguishes value sensitive design from other socially oriented approaches to biases in media technologies, such as media ecology? Four unique features of value sensitive design are worth noting. First, value sensitive design is proactively oriented toward *influencing design*. While the theory and methods or approaches of media ecology are apt for reviewing and evaluating historical or current media technologies, value sensitive design is oriented toward influencing the design of future media and information technologies. Many projects include direct contact and collaboration with design engineers, with the goal of proactively influencing design early in and throughout the design process (see Shneiderman & Rose, 1997). Second, value sensitive design enlarges the scope of technological biases studied to include *biases of moral and ethical import*. Value sensitive design shares the commitment of media ecology to study how the biases of media technologies construct the world in which we live, as well as their social, economic, political, epistemological, and cultural consequences. However, value sensitive design embraces a broader spectrum of technological biases to include those that center more directly on human well being, human dignity, justice, welfare, and human rights. Third, value sensitive design *deepens the methodological approaches* to the study of biases in media technologies. As already noted, value sensitive design employs conceptual, empirical, and technological investigations, applied iteratively and integratively. The empirical and technological focus of value sensitive design provides a methodological enhancement of traditional media ecological approaches, which typically remain rooted in conceptual and historical analyses of media biases.

Finally, when considering value sensitive design from the perspective of the dialectical set of theories of technology, value sensitive design is a fully *interactional* approach to biases in technologies. Value biases are viewed neither as solely inscribed into technologies (the endogenous theory), nor as simply shaped by social forces (the exogenous theory). Rather, the values supported (or hindered) by a technology depend on the technology's actual use. Its biases depend on the biases and goals of the people interacting with it. A pen, for example, is well

suited for taking notes, but it is also amenable to use as a page holder in a book, a weapon, or even a lock pick (see Kahney, 2004). Through the interaction of different social groups of users, the value biases of the pen change. Value sensitive design recognizes the interactional nature of value biases and incorporates the constellation of different users by taking into consideration two classes of stakeholders: direct and indirect. Direct stakeholders refer to individuals or organizations that interact directly with the technological system or its direct outputs. Indirect stakeholders refer to all other parties who are in any way affected by the use or existence of the system. Value sensitive design strives to give particular attention to indirect stakeholders, who are often ignored in the design process, but remain a vital part of a truly interactional approach to technology.

Conclusion

INTEREST in the biases of technologies emerged as early as the time when the works of Mumford (1934), Wiener (1954), and Marcuse (1964) were produced. Media ecology has surfaced as an approach well suited to continue these explorations into the biases of media technologies. With the recent increase in focus on the value and ethical implications of technology, an incorporation of the value sensitive design approach to the study of biases in technologies is essential. This is not to say that media ecology has pursued its goals absent any attention to values. In one of his last formal lectures on media ecology, Postman (2000) spoke about media from a humanistic point of view. He concluded that, "as I understand the whole point of media ecology, it exists to further our insights into how we stand as human beings, how we are doing morally in the journey we are taking" (p. 16). Given Postman's position that media ecology is essentially a humanist endeavor, it is appropriate to integrate value sensitive design's concern for human values into the fold of media ecology. Each approach would benefit from pairing with the other: media ecology would expand its exploration of biases in media by including biases of ethical and moral import, as well as benefit from the empirical and technical methodologies of the value sensitive design approach; value sensitive design would gain the rich intellectual tradition of media ecology and expand its investigations into other media technologies beyond those directly related to computer and information technology. Bringing these two approaches together would invite a productive reconceptualization of the "biases of media," strengthen both traditions, and contribute to the development of a comprehensive and methodologically rich investigation of biases in media technologies.

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Footnotes

[1] A second, and equally provocative, thesis of technological determinism holds that technology is an autonomous force, evolving along a linear and inevitable path, beyond the influence of its social or cultural context.

[2] Value sensitive design builds from the moral philosophical proposition that certain values are universally held, although how such values play out in a particular culture at a particular point in time can vary considerably.

[3] See, for example, "Values in Technology Design: Democracy, Autonomy, and Justice" at New York University (http://www.nyu.edu/projects/valuesindesign/); "ITR: Value Sensitive Design—Integrating Values into the Design of Information and Computer Systems" at the University of Washington (http://www.ischool.washington.edu/Value Sensitive Design/); and "Design for Values" at Harvard University (http://www.designforvalues.org/).

[4] For a partial list of recent courses, see http://www.nyu.edu/projects/valuesindesign/ped.html.