This exam area engages with the work of scholars in deep critical reflection about the relationship between society and technology. In *Where Technological Determinism Went* (2001), Winner observes that much scholarship is dedicated to the discrediting of technological determinism and that discussions about technology's perceived "inevitably, determinism, and imperative" are no longer considered academically stylish (ibid., p. 12; Sally Wyatt, 2008 makes a similar point). Still, because this comprehensive exam is concerned with historical and contemporary perspectives and theories for interpreting the relationship between technology and society, the waxing and waning of the technological determinism debate may provide a useful and orienting signpost to trace the pathways, both forsaken and fashionable, of technology and society theories across time (Heilbroner, 1967; Smith & Marx, 1998). Theories considered here are variously characterized as deterministic (Mumford, 1962 [1934], 1964), universalistic (Castells, 2000), even fatalistic (Ellul, 1967). Still, theorists such as Jacques Ellul (1967) resist being characterized as technological fatalist and insist,

> We must not think of the problem in terms of a choice between being determined and being free. We must look at it dialectically, and say that man is indeed determined, but that it is open to him to overcome necessity, and that this act *is* freedom. Freedom is not static but dynamic; not a vest interest, but a prize continually to be won (xxxiii, italic in original).

This refined dialectical view of technology and society has largely displaced earlier more polarized views of the perceived impact of technology upon society. Contemporary theorists of technological society insist that technology is socially shaped (Mackenzie & Wajcman, 1985) and/or inextricably entwined within heterogeneous socio-technical networks (Callon, 1986; Latour, 1991; Law, 1992) and therefore dependent upon and subject to specific social structures and cultural values (A. Berg & Lie, 1995; Wajcman, 2009). Thus conceived, technology is divested of autonomous force and power and it becomes possible to locate a middle space between technology viewed as ruinous and technology viewed as triumphant (Akrich, 1992; Feenberg, 1999).

I. Classical Approaches to Technology & Society

The first group of readings entitled, *Classical Approaches* (Ellul, 1967, 1980; Giedion, 1948; Marx, 1964; Mumford, 1962 [1934]), represent classical works which aimed at understanding the nature and meaning of technology's impact upon society. These writers worked toward comprehending the unparalleled shift in human experience that took place as society shifted from an industrial to technological ordering principal.

Lewis Mumford's *Technics and Civilization* (1962 [1934]) is considered a pioneering work on the history of technology and remains one of the earliest (English) studies of the complex interplay between technology and culture as well as a foundational work of the *Media Ecology*

discipline. Siegfried Giedion's *Mechanization Takes Command* (1948), concerns itself with describing "the impact of a mechanized world on human organism and on human feeling" (p. 124). Giedion's work moves fluidly back and forth between the art, science, and technology and in this way reads remarkably contemporary in its interdisciplinary approach. Jacques Ellul's *The Technological Society* (1967) does not focus on individual technology as such, but rather on *la technique* which he defines as "the totality of methods rationally arrived at and having absolute efficiency (for a given stage of development) in every field of human activity" (xxv). For Ellul, specific technologies are not the issue, but rather a specific mode of human consciousness produced through unrestrained dependence on technology. Leo Marx's *Machine in the Garden* (1964) is an important socio historical work and significant to the formation of the history of technology as an academic discipline. Marx interrogates the literary response to the industrialization of a pastoral America during the nineteenth century. It is Marx's contention that writers may be regarded as significant repositories of the cultural dialectics of their time seemingly able to capture the tensions, cultural conflicts, and contradictions of an era (p. 342). The title of his book encapsulates the tension he interrogates. That is, the jarring penetration of the industrial machine into the pastoral landscape of the New World.

II. Technology Influencing Society

In this section several strands of inquiry are considered. First, various positions and responses in relation to technological determinism (Heilbroner, 1967; Smith & Marx, 1998; Wyatt, 2008) or "the idea that technological innovation is the basic cause of changes in society and that human beings have little choice other than to sit back and watch this ineluctable process unfold" (Winner, 1986, p. 9-10) are considered. Second, Information Society (Beniger, 1986; Burnett & Marshall, 2003; Lyon, 2005; McGuigan, 1999; Webster, 2002, 2005, 2006) literature and especially the writing of Daniel Bell (1999 [1973]) is examined. Finally, Network Society scholarship is explored, focussing primarily on Manuel Castell's *Rise of the Network* Society (2000) as a key work within network society theorizing, in addition to selections from his most recent work, *Communication Power* (Castells, 2009).

Theories of technological determinism tend to either celebrate technology's transformative capacity or vilify its catastrophic potential (i.e. Heidegger, Ellul, etc.). Thus, determinist theories may be critiqued for their tendency to essentialize within both utopian and dystopian formulations. Scholars such as Ellul regard technology as force of domination. The persistence of technological determinism (in spite of its falling out of academic fashion) is interrogated by Sally Wyatt (2008) as she outlines four major categories of technological determinism. Heilbroner (1967) shows how in capitalist society, technical advance and diffusion throughout society assumes the attributes of autonomous process, 'mysteriously' generated by society and thrust upon its members in a manner as indifferent as it is imperious. This is perhaps why the

notion of techno determinism emerges with such insistence, despite the ease with which its most extreme forms are refuted. Smith and Roe (1998) distinguish between hard and soft determinism.

In relation to Information and Network Society perspectives, Daniel Bell (1999 [1973]) concentrates on the importance of technology, technical knowledge, and occupational change in his theory of Information Society. Castells defined a new paradigm of an emergent modern society as a network, 'a set of interconnected nodes' brought into existence, partially, through ICTs which privileges the flow of information (Webster, 2006, p. 100). Much as Leo Marx (1964) ascribes the machinery of the Industrial Revolution as ushering in a new technological era in the early nineteenth century, Bell and Castells attribute the emergence and diffusion of new information technologies to the transformation of industrial societies to information or network societies.

III. Society Influencing Technology

The third section focuses on a body of scholarship which emerged, partly, out of a desire to evade the hold that a naive 'technological determinism' (Heilbroner, 1967; Smith, 1998) had on the dominant understanding of the connection between technology and society. As Berg and Lie (1995) note, theories involving technological determinism involve a narrow theory of technological development that does not take fully into account social and economic factors. Additionally, we can say that the readings in this section represent more localized and textured approaches to technology and society, than the decidedly more macro-level analyses of Castells and Bell.

The idea that technology is shaped by social forces (Mackenzie & Wajcman, 1985), or is socially constructed (Pinch & Bijker, 1984) is a major contribution of Science and Technology Studies (Cutcliffe, 1990, 2000; Cutcliffe & Mitcham, 2001) to the understanding of the relationship between technology and society. Winner (1986) provides a classic example of technological systems that appear to require or be strongly compatible with particular kinds of political relationships "designed to exercise *force*," in his decisive essay on the low bridges of Long Island which were purposefully designed to deny busses carrying lower class people into more affluent neighbourhoods. Winner's theory attempts to capture the complex interplay between agency and determinism by viewing technologies as political 'forms of life.' These ideas share a similar sensibility with Mumford's (1964) authoritarian and democratic technics as well as Franklin's (1999) prescriptive and holistic technologies.

Scholars such as Madeleine Akrich (1992) propose that we not hold to either simple technological determinism or strong social constructivism. In her view, technological determinism ignores what is brought together, and ultimately replaced, by the structural effects of a network. On the other hand, social constructivism problematically rebuffs the inflexibility of

objects and assumes that only people can have the status of actors. Andrew Feenberg (1999) develops a penetrating critique of both technological determinism and essentialist theories (associated with constructivism) in favour of an approach that is dialectical, that is to say takes into account technology's negative and positive attributes and its status as a site of contestation and struggle.

IV. Politics of Technology

Section four considers how ideas of difference, such as public/private; man/woman; black/white; self/Other underpin and inform technology as well as their broader impact and representation within society.

Consideration of the domestic context (A. J. Berg, 1999; Cowan, 1976, 1985; Silverstone, Hirsch, & Morely, 1994) and cultural representation of technological design and usage (Franklin, 1999; Turkle, 1986; Wosk, 2001) shares with the tradition of feminist scholarship of technology and society (Harding, 2008; Wajcman, 1991, 2004, 2009) an attendance to issues of gender as well as differences in social and political contexts (Balsamo, 2009; Haraway, 1991; Maines, 2009). Wajcman (2009) notes, that a social constructivist framework is now widely adopted by feminist scholars of science and technology.

Continuing the theme of critical assessment of (digital) technology is a set of readings related to the transformation (Chow-White, 2008) of race and technology (Eglash, 2002; Gajjala, 2006; Gray, 2005; Lee & Wong, 2003; Nakamura, 2002; Nelson, Tu, & Hines, 2001). These readings temper technologically deterministic information society enthusiasts and the utopic regard held out for emerging communication technologies. These readings fit comfortably within the socio-cultural tradition of Cyber Space and Virtual Studies.

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