Unit 1 Introduction: Technology and Society

Overview: A Plea for Time

"To live long, it is necessary to live slowly." (Cicero)

The first unit of this course examines the relationship Western society has had with technology over 2000 years. It is an ambivalent relationship that has yielded both a fascination with and a repulsion for the "machine". Many of our ideas about technology as a whole have coloured our attitudes towards communication technology in particular. Chief among our concerns is the nagging suspicion that it is the technological "tail" that wags the societal "dog", and not the other way around. How much is our society designed and controlled by the technologies we use? How do we cope with the spread of technological change? What implications does this technological dominance have for our form of government? This unit introduces crucial issues that are taken up again and again in communication history.

Reading Assignment

The unit commentary will direct you to read these assigned texts:

- Alexander Marshack, "Some Implications of the Paleolithic Symbolic Evidence for the Origin of Language"
- Denise Schmandt-Besserat, "How Writing Came About"
- Eric Havelock, "The Greek Legacy"
- Marcia Ascher, "Before the Conquest"
- Harold Innis, "Media in Ancient Empires"
- Rick Salutin, "Last Call from Harold Innis"
- Daniel Chandler, "Technological or Media Determinism"

Commentary

Don't Talk to Me about Technology!

We *do* talk about technology all the time, in a general, fuzzy sort of way. For example, when the average person defines "technology," he or she might refer to an object (e.g., the radio), or perhaps to components of the object (e.g., vacuum tubes), or to the way the object works (e.g., electrical current passing through a wire to create a magnetic field), or even to the way the object was invented or produced. In other words, our perceptions of technology are often thing-oriented ("What is that?" "I don't know—some new piece of technology, I guess.") or process-oriented ("That is amazing. How does it work?" "I'll show you. It is the latest technology."). Our perceptions of technology are also focused on novelty and change. We tend to be keenly aware of something as Technology (with a capital "T") when it appears to be new or unexplained (Does anyone actually think of radio as technology with a capital "T" anymore?). However we may define it, each of us is aware that "technology" is an increasingly central theme of our daily lives. Our perception of technology depends on whether we feel control over or controlled by the thing (or process) in question.

Our concerns in this course must begin with communication; and the common starting point for that discussion is the human need to create meaning and how that need drives people to certain technologies. Consider Ursula Franklin's definition of "technology": a system of practices (the organization of work and people) and shared values (the models that underlie our thinking and discussions about the practices) (1990, 12). Franklin, an experimental physicist at the University of Toronto, has written widely about technology and society. Her definition is as broad as the previous definitions were narrow. She argues that technology is a system that involves far more than its material components or processes. In addition, her insistence that technology should be seen as a set of practices puts it in the realm of culture, and therefore attaches it to values. If we do not understand technology as part of our shared principles and values, she writes, then the only way to discuss it is with reference to use, or efficiency, which she considers socially dangerous. Technology, Franklin claims, must always be discussed within the context of what its users understand to be right, fair, and just (114–130). Whether it works better, faster, or cheaper is secondary.

Franklin's point of view is that "technologies are developed and used within a particular social, economic, and political context. They arise out of a social structure, they are grafted on to it, and they may reinforce it or destroy it, often in ways that are neither foreseen nor foreseeable"(57). She distinguishes her approach from that of **technological determinism**, which regards technology as an autonomous force. Franklin's concerns represent a common starting point for discussions about technology. She is interested in issues of power and domination in society. Her arguments are constructed to counteract a long tradition that regards the relations between technology and humankind as agonistic.

Communication from the Past to the Future

Launched on March 2, 1972, the Pioneer 10 spacecraft was destined to be the first human artifact to escape our solar system, and it did so on June 13, 1983, when it passed the planet Neptune and out of the solar system. Bolted to the spacecraft's mainframe was a symbolic communication in the form of a 6- by 9-inch gold anodized plaque. Pioneer 11, launched a year later, contained the same message. NASA claims the plaque is designed to communicate to scientifically educated inhabitants of another other star system who might intercept it millions of years from now.

The plaque was designed by Dr. Carl Sagan and Dr. Frank Drake of Cornell University, and drawn by Sagan's wife, Linda Salzman Sagan. It shows the date on which Pioneer was launched, a map locating earth in the solar system, and the trajectory of Pioneer away from the sun. It attempts to show what kind of beings sent it. The key to translating the plaque lies in understanding the breakdown of the most common element in the universe—hydrogen. This element is illustrated in the left-hand corner of the plaque in schematic form showing the hyperfine transition of neutral atomic hydrogen. Anyone from a scientifically educated civilization, according to NASA, having enough knowledge of hydrogen would be able to translate the message. What is perhaps more interesting is what humans in the 1970s (Sagan and his colleagues) thought important enough about human culture to convey to imagined inhabitants of other star systems.

The most contentious item on the plaque is a rendering of a man and woman standing before an outline of the spacecraft. The man's hand is raised in a gesture of good will. The physical makeup of the man and woman were determined from results of a computerized analysis of the average person in the world. Critics at the time claimed that sexism was part of the message being sent to other galaxies. Sagan, Sagan, and Drake admitted in "A Message from Earth" published in *Science* in 1972, "The message inadvertently contains an anthropocentric content. Nevertheless, we feel that an advanced civilization would be able to decipher it" (175). Sagan also maintained that the message on the plaque was hastily put together, but this is no indication of its quality, as you may recall that Mary Shelly wrote *Frankenstein* in a weekend.

NASA reports, "After more than 30 years, it appears the venerable Pioneer 10 spacecraft has sent its last signal to Earth. Pioneer's last, very weak signal was received on Jan. 22, 2003."

At approximately 2:10 p.m. Pacific time on February 17, 1998, Voyager 1, launched in 1977, passed beyond the point that the Pioneer 10 spacecraft had reached and become the most distant human-created object in space at 10.4 billion kilometers (6.5 billion miles). Voyager 1 and Pioneer 10 are headed in almost opposite directions away from the sun.

The Voyager carries a message in the form of a "golden record"—a 12-inch gold-plated copper disk containing sounds and images selected to portray the diversity of life and culture on planet Earth. A committee chaired by Carl Sagan who assembled 115 images and a variety of natural sounds, such as those made by surf, wind and thunder, birds, whales, and other animals, selected the contents of the record for NASA. To this they added musical selections from different cultures and eras, and spoken greetings from Earth-people in fifty-five languages, and printed messaged from President Carter and U.N. Secretary General Waldheim.

What do you think extraterrestrials would make of Azerbaijan bagpipes recorded by Radio Moscow (or Glenn Gould's piano rendering of Bach), an image of a supermarket, or a greeting in Mandarin Chinese? Perhaps they would conclude that humans use sonic and pictorial symbols to make meaning.

Readings

- Alexander Marshack, "Some Implications of the Paleolithic Symbolic Evidence for the Origin of Language"
- Denise Schmandt-Besserat, "How Writing Came About"
- Eric Havelock, "The Greek Legacy"
- Marcia Ascher, "Before the Conquest"

Cave Paintings and other Human Artifacts

Homo sapiens has the information to know itself for what it is: an Ice Age hunter only half-evolved towards intelligence; clever but seldom wise. (Wright 2004, 132)

Cave paintings, like the plaque on Pioneer 10 and the contents of Voyager's Golden Record, were also, in a sense, launched long ago.

Perhaps, too, the original intent was to communicate with beings from another world. We do not know. But cave art is deciphered in a world far, far away by contemporary anthropologists with sophisticated devices at their disposal. (We will not get into Erich Von Daniken's theory that claims that extraterrestrials put the paintings there in the first place.) The message carried by Pioneer 10 and Voyager 1 will undoubtedly prove difficult for extraterrestrials to decipher in the off chance of this scenario taking place millions of years hence. Red ochre images of bears, deer, etc., left on cave walls in France, Spain and Australia thousands of years ago have proved equally difficult for contemporary scholars to decipher through consensual interpretation of their meaning. A wide variety of human artifacts have been excavated, and multiple interpretations have been brought to bear on them.

History of Progress

Archaeologists have long assumed that cave art was the work of sophisticated pre-historic artists. The discovery of the spectacular cave paintings, dating back 31,000 years, in the Chauvet-Pont-d'Arc cave and the paleolithic painted cave of Lascaux in France would appear to substantiate this view. The fluency and realism of animal figures found there seemed to indicate to researchers that humans had evolved the language and other cognitive skills required for a sophisticated painting technique. In this unit, we explore a number of perspectives that look at this issue a little and a lot differently.

Alexander Marshack's essay presents you with one side of this first question in the history of communication: Where does "communication history" begin? Marshack would like it to begin when pre-"historic" people first use tools to create images and symbols that are culturally *useful*. Marshack underlines his argument by demonstrating that once examined under a microscope and decoded, many prehistoric artifacts that have been dismissed by scientists as "bone tools" contain distinct symbol systems that "were markers of periodic and continuous cultural processes, of rites and of repetitive myths and stories . . . [and] notations of whatever sort . . . [for] recording the passage of time in terms of culturally significant events" (2003, 11). You will note that Marshack repeats the word *use* over and over in conjunction with the word *culture*. His point is that these images and symbols are not mere artistic doodlings; they actually *mean* something, and the proof of their significance is that they were used over long periods of time. Marshack writes, "it was not an artistic revolution; it was a cultural revolution" (8).

A formidable academic tradition regards history—indeed, rational thought and democracy—as having its beginnings not just with writing (3000 BC), but with the Greek alphabet, which dates only from about 700 BC. Marshack, on the other hand, is examining symbolic systems as old as 45,000 BC. Marshack must fight two very strong received traditions: cave painting=random doodlings and Greek alphabet=genesis of rational thought and democracy in Western culture. Somehow, Marshack must convince us to shift our thinking from artifact as art (and therefore a frivolous or tangential social activity), to artifact as cultural practice (and therefore crucial to the Cro-Magnon worldview).

Other scholars have questioned the conventional histories of "stone age" peoples; some of these investigations have involved reinterpretations of the centrality of pictographic writing in the origins of writing.

Hieroglyphs

Denise Schmandt-Besserat contends that, prior to the emergence of writing, people in the ancient world (modern day Iraq, Iran, Syria, Turkey, and Israel) used small, clay-fired tokens. She claims that these tokens were an indication of symbolic and complex economic activity.

Marcia and Robert Ascher are well-known for their research in Peru. The Aschers have proposed that the Incas developed the *quipu* (pronounced key-poo), a recording device by which numbers were represented in the form of coloured knotted strings, in order to keep accurate accounts of goods in their storehouses, census information from various parts of their territory, and tabs on who paid and did not pay their taxes—all this without the benefit of writing!

In recent years, other scholars have suggested that the *quipu* is, indeed, a kind of script. One very controversial essay, "Talking Knots of the Inka," published by Viviano Domenici and Davide Domenici in *Archaeology*, maintains that a seventh-century Jesuit manuscript contains evidence of literary *quipus*; that is, *quipus* were used not only to catalog statistical information, but also to make narratives such as astrological observations and mark events such as battles and secessions of power. Domenici and Domenici claim that it "could be a Rosetta Stone for Andean scholarship" (1966).

Readings

- Harold Innis, "Media Empires of Communication"
- Rick Salutin, "Last Call for Harold Innis"

Bias of Communication

The essays by Innis and Havelock prepare us for a second important debate in communication history—one that asks to what extent certain fundamental socio-political changes in a given society are the result of technological innovation. From its most limited perspective, this argument is known as technological determinism—the idea that technology is *the* determining factor in such change. Technological determinism tends to look at communication technology as an active force affecting a relatively passive community of users. The effects, themselves, are generated by the inherent features of the technology, which direct the way the technology is used. Finally, the perceptions of the society in which the technology exists are inevitably altered by it: people experience time and space differently according to which communication technology they use. This particular cause-effect chain treats technology as an elemental force that operates in a context of its own making. Inevitably, this argument leads to considerations of dominance and control.

Harold Innis maintains that the media of communication are central to the rise and fall of empires, and that changes in the *form* of media create drastic changes in institutions, power structures, and cultural values. Innis claims that each medium projects a **bias** of organization and control of information. In this view, the bias of the dominant medium in any empire can help us to explain its character, development and eventual collapse. The bias affects patterns of social interaction, knowledge, and perception.

Innis thinks that the medium of communication imparts a bias towards either time or space and that every empire or society can be characterized, through its technologies, by one bias or the other. A heavy, durable medium, such as clay or stone, emphasizes durability over time. **Time-based media** are difficult to move from place to place and, thus, do not encourage territorial expansion; but their longevity encourages the extension of empire over time. This kind of medium is often associated with the sacred, which usually endures over centuries. According to Innis, an example of a time-based culture would be ancient Egypt, with its vast monuments and its pyramids. The Egyptians carved all their important laws into stone and clay, making for a long and stable empire, over time. Indeed, Egypt is one of the world's oldest, intact civilizations (Wright 2004, 103).

Paper is an example of a space-biased medium: it has a relatively short life, but can be readily transported. **Space-biased media** tend to be associated with secular and territorial societies, because they facilitate the expansion of empire over space. Papyrus enabled the growth of vast empires over space as well as a preoccupation with the secular problems of law, administration, and politics. The Romans sent paper all over their world, building a massive empire over great distances.

Innis' own preference, he admits, is towards the time-biased, **oral tradition**. He sees it as inherently more flexible and humanistic than the written tradition—particularly the modern mass media version of the written tradition—that he considered rigid and impersonal.

> The oral discussion inherently involves personal contact and a consideration of feelings of others, and it is in sharp contrast with the cruelty of mechanized communication and the tendencies which we have come to note in the modern world. (Innis 1964, 191)

Innis' model or ideal type for an oral tradition was based on what he understood as "the Greek experience." The culture of ancient Greece, at least for a time, affected a balance between orality and literacy, between time-biased and space-biased media. Innis writes that the "power of the oral tradition in Greece which checked the bias of a written medium supported a brief period of cultural activity such as has never been equalled" (1964, 64). In his admiration for Greek antiquity, Innis influenced many important scholars, including Walter Ong and Innis' own student, Eric Havelock, who has written extensively on the theme of orality and literacy in ancient Greece.

Innis' view of communication history goes so far as to link alphabetization with the development of democracy, but we must balance Innis' enthusiasm for the "ideal" situation of the ancient Greeks with examples from other places and times. Innis' work makes no mention of the oral tradition in the pre-state societies of Africa, Asia, or the New World. Ironically, given his earlier work on transportation systems, Innis looked outside Canada to support his communication theory despite the fact that oral tradition and democracy existed among the Iroquois in Canada.

Eric Havelock's essay on the "Greek Legacy" has been one of the most influential of its kind in proposing a tight connection between the choice of communication technology and social and political organization. Havelock further contends that communication technologies affect patterns of thought. Although his model is the alphabetic tradition of the Greeks and Romans, his

conclusions have been attractive to many other scholars whose interests lie with more recent technologies.

As Rick Salutin remarks, Innis, himself, considered a mixture of these traditions to be a natural and fertile occurrence. In fact, the written tradition was all the more creative *because* it was informed by the oral (1997, 247). However, Innis' inheritors (Havelock, Goody, Ong) have generally chosen to decontextualize the oral and the written, treating them as autonomous modes of expression, one of which follows the other.

Salutin's reflective article gives you a clear notion of the progress of Innis' thought on technology and society. In his view, Innis finished his career by wondering why he had been so concerned with economics and history all his working life. Innis' answer, in *Bias of Communication*, was that the tools we use, to ask certain questions, to be concerned with certain things, condition us. Our creation of and concern with something called "history" is shaped by the written tradition, which chops time into segments that can be arranged in linear fashion. Salutin thinks that when Innis shows his preference for the time-oriented oral tradition, he is actually musing over what his life might have been like under the dominance of a different set of preconditions—that is, a different technology.

Salutin seems to admire Innis'stance against the prevailing academic discourse at the time Innis was writing about communication, which was the literate tradition. Salutin writes,

> Innis came to the conclusion that "creative thought" was "dependent on the oral tradition." Writing is too fast, it is too unnuanced compared to the complexity of speech. What it means to be human is to speak and listen, to interact with others—and wisdom and insight emerge in that social context. Writing and individual scholarship are a dilution and "dumbing down" of basic human function; they may seem more efficient, in some respects, in creating intellectual "product," but at a cost to the human and mental processes involved. (1997, 247)

Keep Salutin's essay in mind as you encounter Innis' disciples and detractors in the next two units.

Readings

- Daniel Chandler, "Technological or Media Determinism"

Franklin's Model for Analysing Technology

While Harold Innis stunned the academic world by analysing economic history from the point of view of its technology, providing us with such useful concepts as the bias of communication and monopolies of knowledge[1], Ursula Franklin focused on the analysis of technology itself. In her 1989 Massey Lectures, published by the CBC as *The Real World of Technology*, Franklin presents a useful framework for students of communication. She begins by differentiating between two forms of technological development—holistic and prescriptive—which are distinguished largely on the basis of ideas of control (1990, 25). Holistic technologies allow craftspeople to control the whole process. In this technological realm, the product bears the

creative stamp of its producer. Each instance of the product may vary in appearance or quality, depending on the circumstances of its manufacture.[2]

Prescriptive technologies, on the other hand, divide and specialize labour so that no one worker produces a whole. This concept of technology leads to a **uniformity** of product—in fact, uniformity becomes a value. Prescriptive technologies also organize the workplace in such a way that ultimate control of both workers and the product rests with a supervisor or manager.

Franklin identifies the last three centuries in Western society as being dominated by prescriptive technologies, and feels that it is important for us to understand the social context that generated them. She writes that **holistic technologies** operate on a **growth model** of human endeavour. Within this model, humans simply assist in discovering "the best conditions for growth and then try to meet them. In any given environment, the growing organism develops at its own rate" (1990, 27). The growth model, she writes, would see "scale" as just a measure of comparison. In Medieval Europe, for instance, the scale of a cathedral was considered different from, but not more efficient than, the scale of a cottage. If something were built on a larger scale, it was likely a matter of prestige. In fact, in the growth model, Franklin tells us there is a built-in prejudice against the overgrown or unnatural. "Implicit in any growth model is the notion that size and scale are *given* relative to any particular growing organism" (27). What Franklin is describing here is a relatively **open system**, which is responsive to its context.

Prescriptive technologies are based on a **production model** of human endeavour. This is a model in which things are "perceived and constructed without links into a larger context" (27). The premise here is that production takes place under largely controllable conditions, and that improvements in knowledge, design, and organization will eventually ensure complete control. Production becomes predictable in a way that growth can never be. This model is a relatively **closed system** that both disregards and discounts the effects of environment on production and the effects of production on the environment. In such a model, scale is not a measure of comparison; it is a measure of value. Bigger is necessarily better.

The production model, Franklin argues, produces a culture "in which external control and internal compliance are seen as normal or necessary" (23). Eventually, there is only one way of doing things. In China, Franklin writes, the development of prescriptive technologies using a production model resulted in the manufacture of sophisticated bronze vessels in 1200 BC. She suggests that the reorganization of the workplace in ancient China eventually led to the formation of the Chinese bureaucracy, the largest and oldest bureaucracy in the world. Furthermore, she feels that it led to the cultural value of *li*—"the right way of doing things" (20).

Power and Control

Franklin feels that technology is never neutral, but acts as a catalyst for the spread of control and management. Technology is especially insidious, she writes, when it is associated with planning. Once a particular technology becomes institutionalized within various infrastructures, its use is often oppressive. She reminds us that technology is generally introduced and established according to a pattern.

Early Phase. New technology is an option for the wealthy or the enthusiast. It is often introduced with a promise of liberation—the belief that this new technology will free its users in some way. There is an attempt to make the technology appear user-friendly in order to allay fears. Often this effort involves building "use communities," through such devices as clubs and magazines. It is a way of creating "an atmosphere of harmless domesticity around the new technology to ease its acceptance" (97). In this early phase, the users who choose the technology feel a sense of control. Franklin provides a range of examples for her argument from the motor car, to the sewing machine, baby formula, TV dinners, and the computer. We could just as easily substitute such administrative technologies as voice messaging, automated banking, or index cards.

Infrastructure Phase. As the new technology becomes broadly accepted, it is more available to the general population, but also more necessary; then, as often as not, it becomes mandatory. The institutionalizing of the technologies often means that people become "captive supporters of both the technology and the infrastructures," at which time, Franklin writes, "the technology itself may stagnate, improvements may become cosmetic or marginal, and competition becomes ritualized" (97). The infrastructures are established in order to make the technologies easier to use "and to develop dependency on them" (102).

Franklin points to the history of the sewing machine as an example of these two phases. Touted in 1861 as a great liberator for women from the drudgery of hand-sewing at home, the sewing machine was adopted into a factory setting to become the oppressor of generations of women in slave-like conditions in the garment industry. Banking provides another example. Who now has the "option" of doing their banking with "real live" tellers? Bank customers *must* use automated machines for most of their needs, and it will not be long before we are all forced to use the *option* of telephone and Internet banking.

Freeways, too, have become a crucial link in our economic systems; in many North American cities, it is virtually impossible to avoid using them. Winner describes how Robert Moses, the master builder of roads, parks, bridges, and other public works in New York from 1920 well into the 1970s, built a systematic social inequality into his monumental structures of concrete and steel. For Moses, "automobile-owning whites of 'upper' and 'comfortably middle' classes, he called them, would be free to use the parkways for recreation and commuting. Poor people and blacks, who normally used public transit, were kept off the roads because twelve-foot tall buses could not handle the overpasses" (Winner 1986, 23). Moses' bridges embodied social and political choices in their design and construction.

After a time these, structures naturalize themselves and become transparent. After traveling over a road again and again, the social class bias and racial prejudice built into objects that shape automobile culture become second nature, "a way of engineering relationships among people that, after a time, became just another part of the landscape" (Winner 1986, 23). Social inequality has shaped the relationship of people to their cars in complicated ways. The mass production of goods may have *democratized* consumption to the extent of creating a larger potential market for goods like cars. But by making car ownership contingent solely on the ability to pay, it did not *equalize* consumption.

Lest we begin to think of the technology or tool itself as the control, Franklin calls our attention to the relations between tool and task. We live in a context where tools are available for particular tasks; once we become successful using some tools, we are willing to use other tools more often, to adapt them to different tasks, and to invent new tools. Sometimes the tasks, themselves, can be restructured by the available tools, or the tools can redefine the problem underlying the task. She gives as an example the enforcement (= the tool) of speed limits (= the task) as a means of providing for public safety (= the problem). At one time the only way for the police to measure a driver's speed was to follow him or her at the same speed. This unsatisfactory method of maintaining public safety was remedied by the invention of the speed trap, where police use radar to catch individual speeders. This new technology eventually redefined the problem from one of public safety to one of "individual deterrence" that is, people were not asked to observe the speed limit for the public good, but to avoid being caught and fined. The radar traps then led to "fuzzbuster" technology, where motorists tried to avoid being caught as a matter of maintaining their individual right to speed whenever they could get away with it. Franklin offers this as an example of a lunatic spiral away from a first cause (public safety) that was closely linked to the presence of a particular technology.

Time and Space

In her second Massey Lecture, Franklin distinguishes five kinds of reality (1990, 36–44):

1. **vernacular reality**—the direct, immediate experience of the individual that is at the same time private and personal as well as communal and political.
2. **extended reality**—the knowledge and emotions that we acquire through the experience of others (e.g., artifacts on display in museums; oral history).
3. **constructed or reconstructed reality**—the descriptions and interpretations of experience that we consider representative; for example, texts of fiction, advertising, and propaganda that contain the communal themes and motifs that hold our culture together. Often, they are so engrained within our vernacular reality that they are "part of the air we breathe."
4. **projected reality**—the vernacular reality of the future (e.g., notions of heaven or hell; five-year plans).
5. **pseudo-reality**—the result of communication technology, which induces the feeling of "being there." Franklin writes that pseudo-realities are "based on staged, selected and instantaneously transmitted" (42) images that are so powerful they leave the illusion of presence.

All these realities, according to Franklin, have been profoundly affected by modern science and technology. Our sense of the world, Franklin argues, is now largely shaped by pseudo-realities. This situation is the result of the close alliance, since the seventeenth century, of science and technology—to the extent that direct, vernacular experience has been consistently "down-graded" in favour of the "glorification of expertise" (40).

She argues that because we are all trained within a culture where the "laity is unfit to question [the] doctrinal content and practice" (44) of the expert voice, we tend to accept the content of communication technology without stopping to ask how images were formed, gathered, and brought to our living rooms.

Postman, Chomsky, and Gerbner have made this point before, but Franklin feels the truly insidious feature of our relations with these pseudo-realities is the lack of reciprocity, "a continuing form of technology executed inequality" (49). All broadcast technologies (with the exception of the telephone and the Internet), she points out, give the illusion of reciprocity (e.g., talk shows, letters to the editor), but they are essentially organized for the one-way flow of information, or control. **Reciprocity**, on the other hand, introduces the unpredictable. It "can lead to negotiations, to give and take, to adjustment and . . . [it] may result in new and unforeseen developments" (49).

Franklin's point is not to wring her hands and gnash her teeth over the evils of technology. She is trying to encourage her audience to step outside of the **culture of compliance**, which does not question the planned introduction of new technologies. She says that it is a measure of how lulled our minds have become that we keep careful population statistics for humans, but not for machines; that, as citizens, we do not question the fact that our governments are inextricably involved in financing and maintaining the infrastructures for privately owned technologies. For example, standard

> electrical outlets in North America yield currents of 60 cycles at 110 volts while Europe and much of Asia works on 50 cycles at 220 volts. Technical parameters like this often constitute basic non-tariff measures designed to protect or expand technologies of a particular origin.(68)

Remember Franklin as you encounter Units 4 and 6 on the development of the telegraph, telephone, and radio.

Technological Determinism

For Franklin, technology is not an autonomous force; her approach distinguishes her from the ranks of technological determinism. She maintains, "Technologies are developed and used within a particular social, economic, and political context. They arise out of a social structure, they are grafted to it, and they may reinforce it, often in ways that are neither foreseen nor foreseeable" (57). Lewis Mumford maintains that technology is not simply a tool that can be separated from the social context that surrounds it. He describes technique as "that part of human activity wherein, by an energetic organization of the process of work, man controls and directs the forces of nature for his own purposes" (1952, 15).

Carey calls McLuhan a "hard" determinist and Innis a "soft" determinist. Chandler, too, rather casually claims that Innis and McLuhan are technological determinists. Watson maintains that to call Innis a determinist is to misrepresent his political position, "This kind of rigid determination calls up the image of a pessimist, but these descriptions are fundamentally flawed" (2006, 320).

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