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Winston focuses here on technological change, specifically in the sphere of communications, and the kinds of theories that try to account for such change. He explores the notion of causality, that one phenomenon inevitably follows another, by comparing two broad approaches, technological determinism and cultural determinism. The first suggests that technologies, specifically media technologies, develop through their own momentum, following an inevitable logic of their own, bringing about other kinds of change. The second approach argues that social and economic factors are the dominant factors in supporting or blocking the utilization of technology, and making human action the prime mover of change. Using a case study approach, Winston investigates the logics of technological and cultural determinism and makes a strong case for the cultural perspective. Through asking questions concerning the logic of technological development, we can also address the issues of whose interests are being pursued and what social and economic benefits (and losses) might accrue from these developments. The implications of this chapter, and of those by Sinha and Stone (Chapter 15), Hamelink (Chapter 17), and others in this book, include the need for critical examination of, and ultimately public debate about, the application of science in technological development, an area too often consigned to the experts and too often omitted from the study of the media.

This chapter addresses two related questions: (a) How does technological change occur in mass communication? (b) What effect, if any, does the technology have on the content, the output, of mass communication? These questions are related in that they both deal with the historical relationship of technology to communication processes.

The first question is clearly historical. There are various accounts available to explain the nature of these changes. In some, technological developments are isolated: The technology is the dominant, *determining* factor in the process. I will be calling such accounts of change *technological determinist*. Other accounts place a greater emphasis on socioeconomic factors. In these accounts, technology is but one of many forces, influenced by and influencing social, economic, and cultural developments. I will be calling accounts of this sort *cultural determinist*.

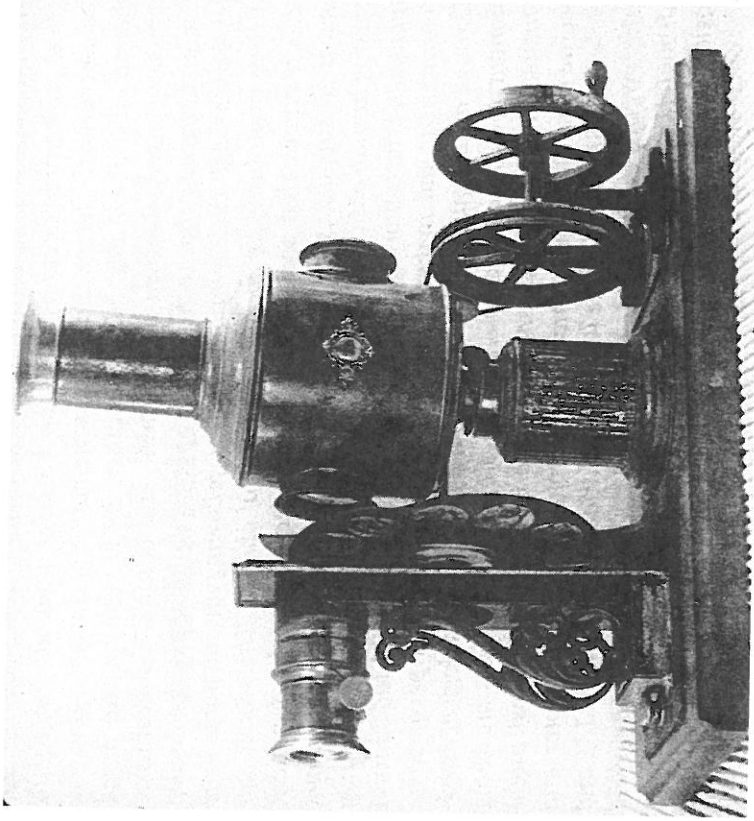
The second question, about the effects of technology on communication, can also be thought of as historical. The only way we can make

## 4 How Are Media Born and Developed?

BRIAN WINSTON

Technologies are not neutral. They embody ideas, needs, imagination, and possibilities from specific periods and places. They are particular solutions to certain problems, usually not the only possible solutions. The same problem identified in another cultural context might find a quite different solution; for example, different architectural styles based on a variety of building materials have developed in different climatic and geographic regions, but all satisfy the basic need for shelter.

Yet technologies can often have such profound impacts that we even define historical epochs on the basis of technological distinctions, from the "iron age" to the "industrial age" and even "postindustrial society." Technologies also have histories, usually a number of histories. Think of the compact disc sound system that may be playing even while you read this. It embodies at least the histories of electricity, of sound recording, of the development of plastics, of the microchip, of interior design, and of consumer electronics design—and we haven't begun to talk about the economics of the music recording industry, its integration with other culture industries, let alone your own particular musical tastes, listening habits, cultural spending, and so on. Thus issues about the development of technologies are complex, and very different kinds of explanations have been proposed to account for technological change.



Film Projector, c. 1870

a judgment as to the effect of a technology on the content of communications is by comparing the content before and after the technology is introduced. Thus the second question, which seems to address only the issue of effects, is also really addressing the issue of change and, in so doing, is historical.

These two questions are linked in another way. Technological determinist accounts of media history tend to stress the role of media technology in governing the content of communication. Conversely, cultural determinist accounts tend to deny technology this determining role. So the answer to the first question above is likely to condition the answer given to the second.

This chapter presents four successive accounts of the genesis of communications technology. It is not, clearly, a full-blown history of media technology, although you may well find some new information

on the subject. It is designed to encourage you to think more carefully about that history, to learn how to evaluate the problems in historical explanations and not just accept them because a scholar has published them.

## Technological Determinist Account A

Technological determinism, notes Raymond Williams (1974),

is an immensely powerful and now largely orthodox view of the nature of social change. New technologies are discovered by an essentially internal process of research and development, which then sets the conditions of social change and progress. Progress, in particular, is the history of these inventions which "created the modern world." The effects of the technologies, whether direct or indirect, foreseen or unforeseen, are as it were the rest of history. (p. 13)

In its simplest form, this dominant theory explains the "essentially internal process of research and development" as nothing more than the biographies of the scientists and technologists involved, arranged chronologically. This account sees the development and impact of technology as "the progress of great men" (women and people of nonwhite cultures tend not to figure).

Here, presented as a case study, is a short history of the cinema written as "the progress of great men," based on a classic history of film (Ramsaye, 1926).

### Case 1: Cinematic Projection

One essential element of the cinema is the idea of projection. The line that leads to projection begins with Della Porta, an Italian, who put a lens on the front of the earliest camera—a simple box. An image was produced on a glass screen set in the back wall of the box. Della Porta made this device in 1555. Next, Athanasius Kircher, a German, produced a magic lantern that projected an image onto a screen (1649).

Peter Roget, an Englishman, theorized in 1824 that the retina of the eye retains an image for a fraction of a second after the image is removed or changed. This "persistence of vision" can be used to fool the eye into believing a succession of separate and slightly different images to be actually one moving image. Toys to exploit "persistence



of vision" by animating drawings were then "invented" by men like Paris (English, 1824), Plateau (Belgian, early 1830s), and von Stampfer (German, 1832). In 1852, von Uchatius, another German, put an animated strip of drawing (done on glass) into a magic lantern and projected the resulting moving image onto a screen.

A substitute for glass now had to be found. The line leading to this part of the cinematographic apparatus goes back to early experiments with substances that change their color, essentially by darkening, in response to light. More research, such as that of Wedgewood (English, 1802), led to the first photograms—images made by laying objects, such as leaves, directly onto materials, such as paper or leather, that had been treated with light-sensitive substances. But these images were not "fixed" and would disappear into black if further exposed to light.

Scientists undertook the discovery of a chemical that would halt the darkening process. In 1837 a Frenchman, Nicéphore Niepce, found a way of doing this and, with his partner Daguerre, produced a type of photograph known as the daguerreotype. Meanwhile, an Englishman, Fox-Talbot, invented a photographic process that produced first a negative, made of chemically treated paper oiled to transparency, and then a positive copy. This, the essence of modern photography, was then refined. A wood pulp extract called cellulose was used instead of paper. Celluloid film finally allowed George Eastman to "invent," in 1888, a camera that anybody could use.

Back to the cinema. It was Edison who took photography and melded it with the developments in animated drawing and magic lanterns to produce the kinetoscope in 1892. There were British, French, and other claimants for the honor of "inventing" the first motion picture device. Two Frenchmen, the Lumière Brothers, gave the first public cinema (their term) show, using a projector to throw a moving image onto a screen, before an audience, arranged as in a live theater, in 1895.

So was the cinema invented.

There are numerous problems with this account. In its eagerness to create "great men," the story becomes highly selective. For instance, Roget's explanation of why we see apparent motion, "persistence of vision," is not really physiologically accurate (Nichols & Liderman, cited in De Lauretis & Heath, 1980, pp. 97ff.), but even very recent histories still begin with Roget and his idea (see, e.g., Beaver, 1983; Mast, 1981).

Real contributions are seen as coming solely from the genius of a single figure, when, in fact, they were the products of collective inventiveness. For instance, it took more than 30 years to go from the development of celluloid, which was originally produced during the U.S. Civil War as a dressing for wounds, to the Kodak. The full story of those years reveals a number of innovations and dead ends. It involves many, many more people than just George Eastman, who successfully marketed a technology to which a lot of hands had contributed.

Edison's role in this process needs to be revised. Edison was running one of the earliest modern industrial laboratories at Menlo Park, California, and pursuing a range of experiments, including investigations into the moving image. His method was to delegate much of the work to his assistants. In the case of the cinema, the work was actually done by a man named Dickson (Hendricks, 1961). Edison knew this full well, but that never prevented him from accepting credit for the "invention" of the kinetoscope.

The poverty, or "thinness," of great-man histories is not based simply on the desire to create heroes. Another crucial factor is the implicit insistence on the primacy of the West. For instance, the camera did not begin with Della Porta, but with Arab astronomers at least 300 years earlier. There is even a reference to projected images in China in 121 B.C. It has been suggested that the first magic lantern lecture in Europe was given by a Jesuit who had learned the technique while a missionary in China, and that Kircher had nothing to do with it (Temple, 1986, p. 86). Even without this, it is possible that the camera was in existence in Italy for more than a century before Della Porta (B. Winston, 1987, p. 199).

You might also have wondered why, in this account, such emphasis has been placed on nationality. In part, it has to do with national pride. But establishing who did something first has more to it than that. Modern patent rights depend on registering an invention first, and that implies financial advantages.

The failure of the great-man style of technological determinism cannot be corrected simply by writing more comprehensive histories. This sort of history really cannot answer the question of *how* technological change occurs; instead, it simply tells us *when*. The only explanation offered as to *how* is that great men, out of their genius, think of them.

## Technological Determinist Account B

There is a more sophisticated version of the technological determinist approach that we need to explore in order to see if these "how/why" questions can be better answered. Here, the changes listed in Case 1 would be treated as a sequence of developments causally related to each other. The "inventors" would be left out, or their parts downplayed. Such a history of the cinema would view its technological development as the inevitable result of scientific progress, part of the never-ending advancement of human knowledge in Western culture. Such an account would suggest that the independent existence of the camera, the lantern, and the lens had to combine to produce the magic lantern. In turn, this development inevitably merged with the development of photography to create cinematography.

The arrival of sound in film provides us with a case study in this more sophisticated mode. This account is based on the work of Ogle (1977).

### Case 2: Sound in Film

Sound recording developed using wax cylinders, disks, and wire before the end of the nineteenth century at the same time as the cinema itself was being perfected. However, these were mechanical recording devices without amplification that would not, therefore, work well in a theatrical environment.

Electronic devices that enabled sound to be amplified evolved out of experiments on the nature of electricity itself, then at the cutting edge of physics. By 1906, a number of independent researchers had produced a tube rather like the electric light bulb then being generally manufactured, but this specialized version could reproduce and amplify electrical signals.

The application of this technology to silent cinema was interrupted by World War I, but experiments continued using various systems. Running film projectors synchronously with phonographs was one. Another, more complicated, converted sound waves, via a microphone linked to a light bulb, into light waves to which the film could be exposed.

The technology was therefore awaiting its moment. That came in 1926, when the industry finally realized that the public would accept sound. Earlier attempts had failed because the technology was not quite developed and because there was inertia about changing over

from the commercially successful method of having live music at each screening.

The introduction of sound also made easier the introduction of faster (i.e., more light-sensitive) film stocks. The very bright arc lights used in the silent studios used to hiss. This was acceptable in silent shooting but bothersome if sound was being recorded. Incandescent lights were then introduced because they made no noise, but they were also less powerful, so the industry needed faster stocks. More sensitive film had been available but unused since before World War I.

This new stock was black-and-white but panchromatic—equally sensitive to all colors, unlike the slower orthochromatic stock it replaced. "Ortho" was blind to red, which it therefore photographed as black. The introduction of panchromatic film affected makeup, costumes, and set design. It also helped, therefore, to put in place production procedures that would facilitate the next major technical advance—color.

Such an account presents a seamless sequence of technical events, each automatically triggering its successor. Each can be delayed by external factors, such as World War I and industrial inertia. But in the end the technology triumphs.

Yet important clues as to *how* technical change occurs can be gained by thinking of *why* a change occurs at a particular time. This is a more complicated issue than it might seem to be at first. Changes do not occur simply because the materials and the scientific knowledge necessary for advance are at hand. The history of the cinema is a good illustration of this.

The great-man account in Case 1 revealed that there was nothing to prevent Kircher from doing, two centuries earlier, what Uchatius did. Kircher could draw and he had glass. And he had just "invented," or borrowed from the Chinese, the lantern that Uchatius was to use.

Such questions can be extended. Why did Della Porta not place a light where he had put his ground-glass screen? Had he done so, he could have created the magic lantern a century before Kircher. And why did the Arab astronomers not pursue these developments centuries before that? Or the Chinese even earlier?

The great-man style of technological determinism cannot help us to answer such questions. It is equally clear that the sophisticated technological determinism of Case 2 is no better. We do not know from Case 2 why early films did not have sound; after all, sound-

recording techniques and motion picture devices developed simultaneously (Hendricks, 1961, p. 111). And we are no nearer to understanding why the Arabs failed to exploit the camera, why Kircher did not invent the camera, and so on.

A better way we can begin to answer these questions is, however, hinted at in Case 2. There we started to hear about forces other than the technological, such as World War I and attitudes in the film industry. In a technological determinist account these are treated as incidentals, but cultural determinists will take these external factors as significant.

Cultural Determinist Account A

To take a cultural determinist view, it becomes necessary to examine the social context of the technology. This implies an examination of the circumstances into which the technology is introduced and diffused through society. In turn, then, a cultural determinist would need to look at the circumstances preceding the development of a technology. Note that the word *development* is preferred to the word *invention* because invention implies a single moment—but these single moments always obscure long-term developments involving many hands. Thus the cultural determinist will at least be an economic historian.

Let us take an economic history type of account of the introduction of sound in film and see how it compares with the technological determinist account offered in Case 2. Here, in Case 3, the key player becomes a corporation (Warner Brothers), but this key player is not a corporate great man. Rather, the struggle to introduce sound is located within corporate competition (Allen & Gomery, 1985, pp. 105ff).

Case 3: The Economics of Sound in Film

In the mid-1920s Warner Brothers was a small studio. It obtained from a New York bank, Goldman Sachs, a line of credit to expand its operations and used this money primarily to acquire movie theaters. Warner's biggest rivals were vertically integrated in this way; that is, studios owned chains of theaters and thus had ready markets for their products. Studios that did not own theaters were at a considerable disadvantage in marketing their films.

Warner also used the money to buy into the new radio industry by acquiring a radio station. This was done because radio was increasingly being used to promote movies. Through this acquisition the company gained familiarity with sound-recording techniques.

It was this changing capital infrastructure in the movie industry that constituted the enabling ground for the introduction of sound. Warner, smaller than the five major Hollywood studios, decided after much internal debate to gamble that sound in its newly acquired theaters would give it an edge. The introduction of sound was thus an attempt to improve market share. Acquisition of a chain of theaters alone was not enough to do this; the chain had to attract audiences by offering something different.

It was the potential disruption to their profitable silent film business, reinforced by their experience of failed experiments with sound dating back to the period before 1914, that "caused" Warner's rivals, the Big Five, not to exploit sound. The technology was available, but the commercial desire and need were not.

Warner successfully demonstrated that sound could be popular with audiences by making a series of variety shorts. Fox, another company struggling to catch up with the Big Five, then demonstrated that sound news films could also be popular.

As a result of this challenge, the Big Five agreed to introduce sound film using a common system. The technology they agreed upon, sound on film, was the most complex and expensive, but, because the Big Five had agreed on it, it was well placed to become the industry standard. It was thus also designed to prevent Fox and Warner, who were using slightly different versions, from continuing to make gains. Warner and Fox fell into line.

The Big Five sound system is the one in use to the present day.

There are a number of differences between the accounts in Case 3 and Case 2. In Case 3 the development of sound film critically depends on the period before its introduction. In Case 2 this period is seen as a lull, a pause before the inevitable triumph of the technology. In Case 3 it becomes instead a period of struggle of the sort that determines not only the pace at which the technology is introduced, but also its form. It is a struggle waged first within Warner, then between Warner and its rivals, to maximize profits and to have a particular technical solution dominate.

The explanation given in Case 3 is not a substitute for the information in Case 2. It is not that we are writing economic history instead of technological history. Rather, we are attempting to combine the



"thinness" of the account in Case 2 by trying to write a "thicker" history, one that describes both. Economic historians, in effect, would add a mass of new information about Warner as a business.

However, economics is a crucial element, but not the end of the matter. Case 3 assumes that the main engines of technical change are the corporation and the market, and that the corporation's motivation will always be to increase the "bottom line." There are two problems with this. One is that technical innovation has not always depended upon the existence of corporations seeking profits. Case 3 is good at explaining sound, but it still does not help us understand why the Arabs, Della Porta, Kircher, and the others did not create the cinema.

Second, much innovation is designed to protect corporations and preserve existing markets, rather than to produce new goods and services for profit. Bell Laboratories is a good case in point. Often considered the most effective industrial innovator in history, Bell Labs was actually established to protect AT&T, the telephone monopoly, from new technologies, specifically radio. By 1878 Bell himself had built a good telephone receiver, but his transmitter was terrible. Edison, by contrast, had patented a superior transmitter, but his receiver was not as effective as Bell's. In this patent standoff, Bell and his business partners hired Emile Berliner to get the infant phone company out of trouble. Berliner, who later built the first device for playing records (the phonograph), did just this. In six weeks' time, he produced a good transmitter without infringing on Edison's patents. Thereafter, this pattern of threat averted by patentable innovation was repeated often, until, in the radio era, AT&T's research programs were finally organized into Bell Labs.

The result of Bell's research program is that every telecommunications innovation has relied to some extent on Bell patents. This includes radio, television, sound film, fax systems, and space communications. No innovation has occurred in the telecommunications field without Bell both agreeing to it and profiting from it. The expenditures lavished on Bell Labs were not therefore simply to maximize profit. They were designed to suppress the disruptive—to Bell—possibilities of innovation.

Thus we need to go beyond the economic historian's version of cultural determinism to something "thicker" still. Central to my argument is that *all* technological communication innovation can be thought of as a series of events taking place in the realm of technology, but influenced by and reacting to events taking place (a) in the realm

of pure science and (b) in society in general. This model has to be rendered even more complex, because society also influences science, which in turn influences the technology. However, for present purposes I will include society's influences on science as part of science itself.

# Cultural Determinist Account B

Let us take another case—television—to illustrate this "thicker" cultural determinism.

## Case 4: Television

As industrial capitalism, from the end of the eighteenth century onward, began to stimulate scientists' inquiries into more practical and profitable applications, so substances were discovered that responded to light in various ways. The basic chemistry of photography emerged, as Case 1 showed, because it was known that some substances darken when exposed to light. Here we will be concerned with the fact that a group of substances alter their resistance to electric current according to the amount of light that falls on them.

Selenium was noted as such a substance by 1839, but no theoretical understanding of why this occurs was offered and no immediate applications suggested themselves for about 40 years. Then it became possible to theorize a device that would translate an optical image (light waves) into a variable electric current, using selenium as a sensor. This idea was prompted by parallel developments that used the variable resistance of carbon to electricity to construct a device that translated sound waves into a variable electric current—a telephone.

The problem for "seeing by telephone," as it was called, was that it had no practical application except perhaps as a facsimile device. But facsimile devices, which allowed for images to be sent by telegraph, were already in existence and worked better, because with the selenium versions there was no apparent way of creating a hard copy. Nevertheless, a device for turning images into an electrical wave analogue using a selenium sensor was patented in Berlin in 1884. Use of the word *television* as a description of this process dates from 1903.

Various researchers all over the world realized that television could transmit moving pictures. But what use would that be? The live theater had been industrialized in the nineteenth century by the

At the end of the war the situation was quite different. The radio industry was looking for a new technology to exploit, having saturated the market with radio sets. In general, the war had greatly expanded the electronic manufacturing capacity of the country, and if that capacity were not to be lost, the public would have to begin to "need" a range of domestic electrical appliances that it had lived without previously. Further, the opportunities for advertising these and other products through television seemed wide open. The Depression decade seemed to have fixed in policy makers' minds that if consumer demand is flat, no economic growth is possible, and after the many sacrifices of the war, a return to depression would have been political dynamite.

if that capacity were not to be lost, the public would have to begin to "need" a range of domestic electrical appliances that it had lived without previously. Further, the opportunities for advertising these and other products through television seemed wide open. The Depression decade seemed to have fixed in policy makers' minds that if consumer demand is flat, no economic growth is possible, and after the many sacrifices of the war, a return to depression would have been political dynamite.

However, it was not an overnight process. The FCC again suppressed the free development of TV by limiting the number of stations that could be built, even instituting a "freeze" on new construction from 1948 to 1952. There were technical reasons for doing this, including the decision as to which color system was to be used, the power and location of TV masts, and the question of VHF and UHF wave bands. But the reasons were not simply technical.

It is often suggested that TV destroyed Hollywood. The great studios are a thing of the past. But where does most TV production still take place? Hollywood. The FCC freeze also allowed Hollywood to maintain its position as supplier to the new TV industry, for it was during that period that the terms of this trade were worked out.

Case 4 attempts to blend all the elements used in the other cases—the individual contribution, the triggering effects of increasing knowledge in science, and the application of other technologies, economic forces, political considerations, social policy, and general cultural factors. These various elements can be thought of as relating in the following way. Imagine the realm of science as a line going from the past to the future:

past \_\_\_\_\_ future  
science

Now imagine a parallel line, which we will call *technology*:

technology  
past \_\_\_\_\_ future  
science

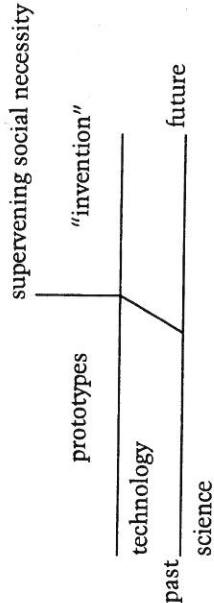
past \_\_\_\_\_ future  
science



These two lines are connected in the mind of the technologist, the person who has an idea for an application:



The idea is triggered by the understanding of science but is expressed "in the metal" as a technological device. History shows the technologist is likely to build a whole series of devices, some slightly, some radically, different from one another. The device we commonly call the "invention" does not differ from the others because it works and they do not. Often the "preinventions" work just as well. What makes the difference is that a point is reached where one of these contrivances is seen to have a real use. After that recognition of the *application* the device is considered an "invention"; before, it is a "prototype." We will call the emergence of an application *supervening social necessity*:



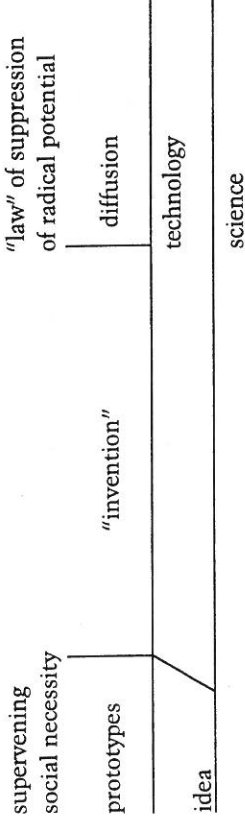
Supervening social necessities are the accelerators that push the development of media and other technology.

In Case 4 the supervening social necessities that influenced the development of television include the rise of the home, the dominance of the nuclear family, and the political and economic need to maintain full employment after World War II. Because of these, the device finally moved out of the limbo of being an experiment to being a widely diffused consumer product.

Supervening social necessities are at the interface between society and technology. They can exist because of the needs of corporations, as when Kodak introduced Super 8 film because ordinary 8mm film had saturated the market. Or they can become a force because of another technology. Railroad development required instant signaling systems, and so enabled the telegraph to develop. Or, as in Case 4, general social forces can act as supervening social necessities. Tele-

phones emerged in the late 1870s because the modern corporation was emerging, and with it the modern office. Not only telephones but elevators, typewriters, and adding machines were all "invented" during this period, although the first typewriter was patented 150 years earlier, the adding machine dated back some 250 years, and the modern hydraulic elevator had been available for more than 20 years.

But if there are accelerators, there are also brakes. These work to slow the disruptive impact of new technology. I describe the operation of these brakes as the "law" of the *suppression of radical potential*, using "law" in its standard social science sense to denote a regular and powerful general tendency.



The brakes in Case 4, which caused television to be nearly a century in development, show its radical potential being suppressed, and are thus an instance of this "law." The brakes ensure that a technology's introduction does not disrupt the social or corporate status quo. Thus in the case of TV, the existence of facsimile systems, the rise of radio, the dominance of RCA, and the need not to destroy the film industry all acted to suppress the speed at which the new medium was introduced, to minimize disruption. The result is that all the main film and radio interests of the 1930s are still in business today, and television can be found in practically every house in the nation, sometimes in almost every room.

This concept of supervening social necessities and the "law" of the suppression of radical potential represents one way in which a cultural determinist would seek to understand the nature of change in media technology. I would argue it to be a more effective, more *powerful* way of explaining these matters than any that the technological determinists can produce. For instance, we can now, using this model, answer the questions posed above about the Arabs and the Chinese. The Arab astronomers who pioneered the camera did so for astronomical reasons, which were their supervening social necessity. Furthermore,

their Islamic faith by then forbade the making of realistic images of living beings, so that culturally they would have been prohibited from exploring the camera's image-making potential. That was how the "law" of the suppression of radical potential operated on their research agenda. The Chinese produced these technologies in the context of an imperial system that used them as marks of distinction for the court. The culture made the technologies elite and limited and therefore suppressed their further development. It is these sorts of factors, not scientific knowledge or technological know-how, that condition technological developments.

### Effects of Technology on Communication Content

We can now begin to address our second question. All communication modes except face-to-face speech depend on technology. Mass communication requires technologies of a sophisticated kind. The question is whether any such technologies determine what gets communicated.

Answers come in weaker and stronger forms. The weakest form is also the easiest to agree with, namely, that it is obvious that not all technologies can do the same thing. A typewriter cannot convey the same information as a photo. But can we go further?

In his essay in this volume on cultural imperialism, Mohammadi (Chapter 21) reviews a well-known study by Daniel Lerner (1958) that argued, based upon research in the Near East, that when modern media were suddenly injected into a traditional village environment in the Third World, they had the effect of expanding many villagers' horizons and expectations quite dramatically. This is a stronger version of the claim that media technology determines the communication that takes place. Mohammadi notes the highly questionable assumptions also carried with this theory, but we might agree that the theory's basic assertion is plausible, even if we might want to rein it in with further "buts" and "if sos." Similarly, Sreberny-Mohammadi's argument about forms of media in Chapter 2 is an intermediate version of the argument that media technologies must be incorporated into the analysis of media effects. So far there may be room for dispute on individual points, but not on the basic position.

However, the stronger versions are quite frequently to be met with in the generalized pronouncements about media influence in the world

today that commentators and editorial writers reproduce from time to time. The most renowned exponent of the strong position was Canadian media theorist Marshall McLuhan, who—even though I am now about to attack his arguments—has the distinction of having first encouraged the general public to think seriously about the impact of media technology on society. He was one of a group of Canadian historians, anthropologists, and literary critics who developed a body of ideas suggesting that in communications, technology is the determining influence. His most frequently quoted aphorism is that "the medium is the message" (McLuhan, 1964). He meant by this that media content (the explicit message) explains far less about communication than the communicative impact of the technical medium as such, viewed in terms of its effects on whole societies and cultures over centuries of their development. Actual media output therefore was of comparatively little interest to McLuhan. Here is how he describes the impact of printing-press technology:

Socially, the typographic extension of man brought in nationalism, industrialism, mass markets, and universal literacy and education. For print presented an image of repeatable precision that inspired totally new forms of extending social energies. . . . The same spirit of private enterprise that emboldened authors and artists to cultivate self-expression led other men to create giant corporations, both military and commercial. (p. 157)

The key words here are that "print presented an image of repeatable precision that inspired. . . ." It is a claim not merely that the printing press determined the content of books or pamphlets, but that leading aspects of our communicative culture (literacy, education, self-expression by authors and artists), our institutions (industrialism, giant corporations, mass markets), and our political self-understanding (nationalism) were summoned into being by this media technology. It goes beyond a technical explanation of how media technology developed to provide a media-technological explanation of modern society.

But McLuhan's approach, although grounded in his reading of history, is difficult to sustain on the basis of the historical evidence. All the effects of the printing press he outlines took centuries to manifest themselves. Nationalism, in its modern form, dates from after the American and French revolutions. How then can a device introduced nearly 300 years earlier have "caused" nationalism? Similarly, universal literacy and the rise of great corporations date from the

second half of the nineteenth century, some 400 years after the printing press had been introduced into the West.

McLuhan's technological determinism depends upon a very loose idea of historical causality. "Perhaps the most significant of the gifts of typography to man is that of detachment and non-involvement," he asserts (p. 157). This assertion is built upon his prior claim that the printing press gave birth to the individual author and artist. But his position is untenable. In what sense are modern people more communicatively uninvolved and detached than they were in the past, specifically the medieval European past? Certainly our sensitivity to human cruelty toward other people and animals is vastly increased, although we can be just as brutal, and now on an industrial scale, as our ancestors. How could it be shown that before print there were no authors, artists, or ordinary people who thought of themselves as individuals in the way we think of ourselves today?

Furthermore, McLuhan's basic mode of reasoning may have important ideological effects. If technology is an external force, like nature, it cannot easily be subjected to social control. It implies we are helpless in the face of such a force, rather than that we can adapt and use technology for our own freely determined purposes. The chapters on broadcasting in Western Europe (McQuail, Chapter 9), on Soviet media (Downing, Chapter 11), on alternative media (Downing, Chapter 14), on the audience (Candy, Chapter 13), and on popular music (Negus, Chapter 22) are only some of the contributions to this volume that point in quite the opposite direction to McLuhan's position.

One last example: For the technological determinist, the fact that color film does not easily photograph Black skin tones is the result of the technical properties of the dyes used in those films. The cultural determinist will want to explore this matter a little more thoroughly. I would begin with the fact that color film was largely created by white scientists to photograph white skin tones. These products do not simply reproduce nature. Each color film stock the chemists designed contained a different solution to the basic problem of representing—or, better, *re-presenting*—natural colors. Each produces a slightly but noticeably different result.

In doing the creative work involved, the chemists are forced to make choices as to which colors their film will respond to best. For reasons grounded in the fundamental physiology of color perception within the human eye, any one set of choices will result in a film that cannot represent Black skin tones as well as it represents white. Color film

stocks in general tend to give Black people a greenish hue. Indeed, the research literature on the development of such stocks reveals that the chemists were primarily interested in getting so-called white (i.e., Caucasian) skin tones as acceptable as possible. They simply did not concern themselves with how Black people would be photographed (B. Winston, 1985, pp. 195ff.). In this way we see once again that it is the social context, not the technology, that determines the content of communication forms.

## Conclusions

At the outset, I noted that the answers given to the question concerning how media technologies develop will in turn condition the answers given to the parallel question of what impact technology has on the content of communication. The technological determinist, who wants to see the technology as all-powerful, operating as though in a historical vacuum, will tend to see the influence of media technology on content as overwhelming. The cultural determinist, who wants to place the technology firmly in its social context, will also want to see that context as the primary factor determining both media technology and media content.

Technological determinism tends to present us as comparatively impotent, as malleable consumers, unthinking and unprotesting, in the face of media technology power. The cultural determinist view, by contrast, is empowering. By drawing attention to the ways in which society constantly conditions technological developments, this view gives us the power to evaluate media technologies and to understand that we are not in the grip of forces totally beyond our control. These implications also show us why theories in general are important. Theories can help or hinder us in coming to an understanding of the world. Without that understanding we cannot act. Thus theory is critical to action.

## Further Questions

1. Can the pattern described above—of supervening social necessities and the "law" of the suppression of radical potential (B. Winston, 1986)—be applied to the history of any mass medium (e.g., radio)?



2. How do media technologies affect one another? What has been the impact of the compact disc on recorded music? Has television changed as a result of the VCR?

PART II

Media, Power, and Control

In this section we introduce you to the key linkages between communications media and power, both political and economic. More than any other factor, power determines what happens; it is a central issue for anyone interested in understanding human society, whether the concern is with power in relationships in the family, in the classroom, in the economy, or in international relations. However, how power actually works, what the ingredients are in a power relationship, is very hotly debated.

Defining power is not straightforward, but we can make some basic statements. Governments have power to make laws and policies. The armed forces, the judicial system, and the police have power to enforce laws, just or unjust. Major social movements, such as the U.S. civil rights movement of the 1950s and 1960s or the ecological movement, also have power—the power to press for change. Big corporations have power, too: to hire and fire workers, sometimes thousands at a time; to close plants and move elsewhere; to decide what to produce, and how, and what prices to charge; and to influence government, as in the case of defense contractors and their multibillion-dollar dealings with defense ministries. The study of how these centers of power in government and the economy interact with one another is often called political economy.

One important approach to the critical study of communications focuses on the political economy of the media: their relation to the state and to the domination of the economy by giant corporations. (The state as used here does not refer to one of the states of the Union;

political economy