

The Development of American Television:
The Technology and Its Determinants

by

Peter Andrew Ward

A thesis
presented to the University of Manitoba
in partial fulfillment of the
requirements for the degree of
Master of Arts
in
the Department of Sociology

Winnipeg, Manitoba

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THE TECHNOLOGY AND ITS DETERMINANTS

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PETER ANDREW WARD

A thesis submitted to the Faculty of Graduate Studies of
the University of Manitoba in partial fulfillment of the requirements
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MASTER OF ARTS

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Abstract

Most analyses of television focus on the medium's effects on culture. But television is itself a cultural product and has taken the form that it has owing to the influences of American government, business, and ideologies.

Because of its technical complexity, the medium was the product of many years of experimentation by the research divisions of large electronics manufacturers. These organizations envisioned that television could be used to augment the telephone, motion-pictures, and the radio. Corporate executives chose to develop television as an extension of radio broadcasting because this use promised the highest profits. Nevertheless, they justified their decision by claiming that they were introducing a medium that would help foster a new type of community - one that catered to individual tastes and was entirely voluntary. Corporate officials were thus able to cloak their pursuit of profits in talk of universal benefits. The result was that no one challenged the employment of television as a broadcasting medium.

The character of the American government was also crucial in shaping television, although many of its policies were designed to regulate radio broadcasting. The government's first strategy was to supervise and harmonize the use of radio waves by individuals and corporations. This allowed commercial broadcasters to gain control over most stations and to broadcast whatever they pleased. Challenges to their control only began in the 1930's, by which time commercial stations had entrenched themselves and could exert considerable influence. Consequently, government efforts to promote non-profit broadcasting had to be content with building a network around the fringes of commercial broadcasting.

Manufacturers and commercial broadcasters shaped television to suit their own purposes. Consequently, any attempt to change the nature of American television must be directed at the organizations that control the medium, and their practices.

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Contents

	Page
Abstract	i
Acknowledgements	ii
1. Introduction	2
2. Historical Overview	16
2.1 Antecedents and Prototypes	17
2.2 The Origins of Broadcasting	21
2.3 Government Regulation of Radio	30
2.4 The First Television	34
2.5 Technical Improvements and Regulation	41
3. Television as a Broadcast Medium	54
3.1 Prototypes and Their Designers	55
3.2 Corporate Development	60
4. Government Influence on Broadcasting	73
4.1 Manufacturers and Networks	74
4.2 Advertising and Broadcasting	85
4.3 Business, Government, and Television	106
5. Conclusions	112
5.1 Overview	112
5.2 Ideology of Technology	115
List of Abbreviations	121
Bibliography	122

Introduction

I

Since it has become commonplace, television has been a frequent topic of investigation in the social sciences. The typical approach has been the study of its effects and even a cursory check of the literature reveals numerous studies that discuss the influence of television on aggression, anti-social behaviour, politics, the arts, other media, education, the economy, sexual stereotypes, international relations and children. A second approach explores the nature of television and television programs, and tries to determine the essential characteristics of the medium and its products. The third, and least elaborated, treatment of television focuses on its

history and development - how did it come to be? That the first perspective has attracted the most attention is not surprising since our immediate concern with a technology is to assess how it affects us. Although there is no consensus among these 'effects' studies, no one seriously argues that it has had no influence on individuals, institutions, or cultures. The study of effects is concerned with the relationship between television, society, and culture, but this focus illuminates only part of these intricate connections. The other, and complementary, side - how television has been fashioned by politics, economics, and culture - is more often alluded to than described. It is this question that I shall pursue by investigating the development of the technology and its social context.¹

But in what sense can we speak of technologies being shaped by their circumstances? Even unsophisticated discussions admit that technologies are influenced in some ways by socio-historical conditions. For example, the phrase 'before its time' is conventionally used to describe the lengthy period between the designing of a technology and its domestication.² The statement implies that a technology may be incompatible with prevailing ideas, institutions, or a culture until there is a more propitious confluence of technical, social, and economic conditions.

¹ By technology, I refer not only to a physical apparatus but also to the skills, procedures, and routines associated with the operation of the apparatus, and the organizations that structure this activity.

² "A domesticated technology is one that has been integrated into the everyday functioning of a society ... Its usefulness or necessity is no longer debated." Dr. Eustace Mendis, 'New mousetrap technology makes crystal ball go cloudy', The Globe and Mail, February 15, 1988.

The Analytic Engine clearly illustrates in what sense a technology may be 'before its time'³. This machine, which was designed by Charles Babbage in the 1830's in England and is similar to a crude computer. They share some design features, such as a separate store for holding numbers and mill for working them, and the capacity to program different mathematical operations, among others. But unlike electronic computers, the Engine was completely mechanical. Although it was never completed, those parts that were built functioned adequately and modern computer designers believe that the finished machine would have worked.

All this raises a question relevant to our inquiry: why was a machine that could have been made and would have worked abandoned? In this case, the interplay of economics and politics provides us with an important clue. Specifically, Babbage was never able to acquire the money necessary to build the Analytic Engine. No private manufacturer constructed one because there was no apparent potential for immediate profit. As a consequence, Babbage had to ask the British government for money. In the absence of a government authority or bureaucracy responsible for funding technological research, Babbage petitioned the Prime Minister, the Duke of Wellington, who had no scientific or engineering expertise. He justified expenditures on his engine on the grounds that it might have some practical use in the future and that its production would improve machine tools and industrial crafts. Modern governments are more likely to accept such arguments and many have established organizations to realize these benefits. For example, the Minister

³ Anthony Hyman, Charles Babbage: Pioneer of the Computer (Hong Kong: Oxford University Press, 1984).

of State for Science and Technology supported Canada's participation in the construction of a space station because the purpose of doing so "...is to use the technology, diffuse and adapt the technology that is developed for space in more traditional uses."⁴ But in the nineteenth century, the British government did not consider the encouragement of technological improvement to be part of its mandate and thus successive Prime Ministers rejected all of Babbage's requests.

In short, the Analytic Engine was not built because there were no institutions that funded technologies with only a future or indirect benefit. Here, then, is an evident relationship between technological development and institutions; only those technologies that help achieve the goals of the institution are likely to be developed. While we have established that institutions and their policies can thwart the production and domestication of a technology, it is not clear from this example whether broader social considerations shape a technology beyond the choice of whether or not to develop it.

In his essay 'Do Artifacts Have Politics?', Langdon Winner argues that technologies do embody social relations, are shaped by political interests, and affect the distribution of power and authority. He argues that technologies are political in two ways: in some, the political effects arise from some design feature or the

⁴ Frank Oberle, Minister of State for Science and Technology, Minutes of Proceedings and Evidence of the Standing Committee on Research, Science, and Technology, 15:4-5, March 2, 1987 (Ottawa: Queen's Printer, 1987).

⁵ Langdon Winner, 'Do Artifacts Have Politics?', Daedalus, 109, 1, (Winter 1980), pp. 121-136.

interplay between the technology and political and economic interests; other technologies are inherently political. As to the former, the political implications may or may not be intended. For example, there are a number of bridges over parkways in Long Island, New York that are as low as nine feet above the curb. Robert Moses, the planner of the road system, had them built this way so that twelve-foot high buses could not pass beneath them. Thus those who relied on public transportation could not get to some public parks. This was a deliberate attempt to make recreational areas inaccessible to the poor, who normally travel by bus, and demonstrates how political views can be translated and effected by technology. On the other hand, until recently many public buildings were inaccessible to those confined to wheelchairs. In this case, architects did not deliberately make the buildings inaccessible; rather the bias was a result of oversight and is being remedied. As in the case of the parkways, it was a specific design feature, or lack of features, that possessed the political quality, but unlike the parkways the exclusionary consequences of these buildings were not intended.

The buildings and the parkways would have functioned just as effectively if they had not had political sources and implications; roadways and bridges need not exclude buses. Other technologies are political owing to the way that their intended use is linked to a wider system. For example, Cyrus McCormick II added a machine to make iron mouldings to his reaper factory in the 1880's. These machines produced castings that were more expensive and of inferior quality to those produced by the earlier method. McCormick had introduced these machines to eliminate the need for

skilled iron moulders, who had just formed a union. After three years, the moulding machines were abandoned having served their purpose, i.e., to destroy the union. The relationship between McCormick and his employees, and not the simple need for mouldings, caused this technology to be introduced.

In the above examples, the political bias of a technology is either consciously pursued or it is the result of a design feature. But there are also technologies whose development inherently favours some interests over others. The mechanical tomato harvester, which has replaced hand picking, illustrates this type of political quality. The harvester can move along a row of tomato plants cutting down the plants, taking the fruit off the plants, and sorting the fruit in one pass. Because these operations can be done at the same time, the harvester reduces the cost of producing tomatoes. But since its size and cost make it practical only for large farms, it has resulted in the incorporation of smaller farms into larger. Although more tomatoes have been harvested, the number of tomato farms has declined 85% over a decade, and thousands of jobs for tomato pickers have been eliminated as a result of the introduction of the mechanical harvester.

A law suit was filed by an organization representing farm workers against the University of California because the University, using public money, developed the harvester which benefitted some private interests to the detriment of many others. The University argued that to accept the argument of the suit "would require the elimination of all research with any potential practical application."⁶ The University

⁶ Winner, op. cit., p.126

researchers, as far as anyone knows, did not design the harvester to favour concentration in the tomato industry. They sought to design a harvester that had 'potential practical applications', which in capitalist agriculture usually means a machine that reduces the cost of production. In this case, reducing the cost of production was achieved by replacing human labour with machine labour, and the machine that achieved the lowest production costs was of a size and cost that could only be accommodated by large farms. Hence, it is the practical application of technology within a particular set of circumstances that caused the unemployment and concentration in the tomato industry, independent of the specific intentions of the researchers. The very goal of technological development in capitalist agriculture has results that favour some interests over others.

Winner asserts that the political characteristics of the bridges, buildings, iron moulding machines, and tomato harvester are not inherent but are the result of their design. Even the mechanical harvester could have been designed to bring about a different result, e.g., if the electronic sorter had not been added. Nevertheless, there are technologies that are inherently political since any way that they are employed presupposes certain kinds of authority and social arrangements. An extreme example is the atomic bomb which, by virtue of its destructiveness, must be strictly controlled. Such a lethal weapon must be managed by a centralized and hierarchical organization that protects the bomb from internal and external influences and ensures that it is not used irresponsibly. This technology can be seen as inherently political since its production, management, and deployment must be authoritarian.

Alfred D. Chandler, in The Visible Hand⁷, argues that a large-scale bureaucratic corporation resulted from the imperatives of managing railways. The large areas in which railways operated and the size of their organizations made family management difficult, and that form of capitalist management was replaced by centralized corporations that were administered by professional managers. The railway was another technology that had an inherent political bias because it is most compatible with a particular social organization.

Winner goes on to show that technology is a means of imposing a particular order on the world, and that this order is neither natural nor neutral. The tomato harvester may seem ordinary and simply a 'better way' of picking tomatoes, but the social order it imposes is not inevitable, immutable, or to everyone's benefit. Political considerations and actions shape technologies at three levels. The first is at the level of mutable design features, that may or may not be deliberate, such as the height of bridges over parkways. These design features are not directly related to the main use of the technology. The second is the political consequences of the use of the technology such as the iron moulding machine and the tomato harvester. The use of these machines directly benefits some interests to the detriment of others. The political results may not have been intended, but they are a direct result of the intended use of the technology. The third level is the quality where the technology is most compatible with some forms of social relations, and it is not so much the use

⁷ Alfred D. Chandler, The Visible Hand: The Managerial Revolution in American Business (Cambridge, Mass.: Belknap Press, 1977).

of the technology that is political as its management. At the first two levels, the technology entrenches existing political relations, and they can be said to embody these interests. The technologies are developed with certain uses and effects in mind, and these, deliberately or not, affect arrangements of power and authority. Both intentionally and unintentionally, political factors separate from the technology both call for it and shape it. Winner looks only for the embodiment of politics, i.e., structures of power and authority, within technologies, but there is no reason that technologies cannot also embody other socio-cultural forms.

With these general points in mind, we may ask how television was fashioned and what political, social, and cultural relations were expressed in its development? In other words, what influenced the actual form television took as we know it? Most accounts of the development of television are either anecdotal or technical histories, and thus do not delineate the circumstances that influenced it. One exception is Television: Technology and Cultural Form, by Raymond Williams.⁸ In this brief account, Williams considers television in a broader historical perspective in which the technology and its products are shaped by socio-historical forces. Like Winner, Williams argues that technologies are developed with certain purposes and uses in mind, to fulfil social needs that have been generated in a particular historical setting. Not every emergent need will be fulfilled through the application of a technology since the technical means to fulfil it may not exist. More important, the speed with which a need is met, if at all, depends on the value placed on that need by powerful

⁸ Raymond Williams, Television: Technology and Cultural Form, (Glasgow: Fontana, 1974).

groups. If the need is given priority, the group can invest in known or desired methods to achieve what it desires, and the pace of development depends on the resources that the group musters. Other groups can also develop that technology for their own purposes, and a domesticated technology may have unforeseen uses and effects. Williams, however, differs from Winner in as much as he explicitly recognizes and concentrates on the consistency to the political and cultural forms embodied in different technologies.

According to Williams, television was a consequence of the introduction of industrial manufacturing. Workers were gathered in factories and thus had to establish a new set of social relations unlike those they left behind in the countryside. Industrial society is characterized by a dual mobility entailing an initial move from the countryside to city. Second, there is movement from job to job because of the absence of firm bonds between the worker and his employer and workplace. Although social control had been implemented by school, church, community, and the family, all, save the latter, lost influence in the industrial settlements. Traditional forms of communication could no longer effectively convey messages nor were they capable of expressing meanings relevant to the inhabitants of industrial settlements. For Williams, human experiences are invested with meaning and purpose by virtue of their organization into patterns or configurations that are intimately bound up in forms of communication.⁹ When social existence changes

⁹ In this regard, Williams follows the formulations of Harold Innis in his The Bias of Communication, although Innis is not cited.

radically, such meanings can no longer be interpreted or conveyed by the traditional modes of communication. The awareness of the changes brought about by industrialization led to a redefinition of the functions and means of social communication. The need for effective communication in industrial society was first met by specialized forms: "...the press for political and economic information; the photograph for community, family and personal life; the motion picture for curiosity and entertainment; telegraphy and telephony for business information and some important personal messages."¹⁰

From this perspective, Williams argues that broadcasting and television can be viewed as responses to particular needs in the dominant culture, and, in retrospect, as powerful tools for social control and integration. Nevertheless, television's use was not determined by the need for new modes of communication or the technology itself. Rather, the wider social system that called forth television also influenced the way it would be used and the institutions that grew around it. For example, it was not inevitable that television was developed for transmission to individual homes; possible alternatives were close-circuit television, televisions with large screens in cinemas, and telephones with a video component. The decisions to employ television as a broadcast medium in the home were guided by a cultural condition that can be described as "mobile privatization". As people became aware of the increasing mobility and rapid change brought about by industrialization, they lost the sense of being in control of their own lives. The reaction to being subjected

¹⁰ Williams, op. cit., p.23.

to forces beyond their control and comprehension was to withdraw from public life and community. Simultaneously, increasing wages and fewer hours of work led to greater consumption in the home. Since it was the institution in which most of the individual's needs were met, the home took on an aura of self-sufficiency even though it could only be maintained with external resources. Hence, the privacy of the home was "an effective achievement and a defensive response"¹¹ and demanded a new form of communication, one that brought news from 'outside' into the home. Thus, television was a response to the decline of traditional modes of communication that was consistent with the mobility and privacy characteristic of capitalist, industrial society.

Commercial interests were initially motivated to develop television by the prospects of profits from the sale of television receivers. But introducing a new means of social communication was not their first priority. They invested in broadcasting only after they had improved communications between existing institutions to meet the new demands of long distance operations. With improved transportation, commercial and military interests could maintain far-flung operations, but communicating between the central points of control and distant offices remained a problem. Telegraphy, telephony, and, initially, radio were developed for these interests; it was only after they had overcome the difficulties of long distance communications that the electronics manufacturers invested in broadcasting.

Television was a solution to the problem of social communication in an

¹¹ Ibid, p.27.

industrial society, and its production was motivated by the promise of profits from the sale of television receivers. But these aspects of television are not inevitably congruent, since the manufacturer is not necessarily interested in the content as long as something is broadcasted. The question of how to pay for programs was solved in different ways in different countries depending on the particular relations between institutions. In Britain, the solution entailed the creation of a government authority, the British Broadcasting Corporation, that would produce all programs and pay for them by levying a license fee on all receivers. This reflected the close bond between the British government and industry since the electronics manufacturers urged the government to intervene to facilitate the sale of receivers. By contrast, American industry discouraged government intervention, which is consistent with the more distant relationship between American government and business at this time. Hence, American broadcasts were paid for by advertisers which has influenced the program content and, until recently, made American and British television programs distinct.

On close inspection, Williams' account provides only a vague outline of the possible political, economic, and cultural forms that influenced television. Despite the attractive aspects of this account, namely a demystified and dereified view of technological development, his formulation ultimately fails to convince because it lacks detail and a coherent description of specific linkages. While Williams argues that television was shaped by specific decisions, he does not identify them, discuss the options, or indicate who decided. He postulates that something called "mobile privatization" shaped these decisions but he adduces no evidence that one choice was

more consistent with mobile privatization than another.

Nevertheless, this account is a useful point of departure because it directs our attention towards several relationships and institutions. Williams argues that the interplay between the government and business interests shaped the broadcast medium into what it has become, i.e., an industry dominated by three advertising supported networks with a small, non-profit network on the fringes. Moreover, he looks to the relationship between economic changes, large corporations, and the promise of a new type of community to explain how television, which literally means 'vision at a distance', became an extension of radio broadcasting. Consequently, in what follows, we will look to the relationships to determine what socio-historical forms shaped American television. But before doing so, it is necessary to get a general idea of the technology's development.

Historical Overview

II

The history of television in the United States began in the 1870's when the electrical transmission of images became scientifically possible. At the time, electrically encoded information was being transmitted by telephone and telegraph and the capacity of the telephone to transmit sound over long distances logically led to interest in the transmission of images. After all, if sounds could be transmitted and reproduced, why not images or pictures?

To send information electrically, it must be converted into coded electrical impulses and then decoded without losing much of the content. This is relatively simple for the telegraph because the message is manually encoded and decoded by the operator. By contrast, the telephone transmits much more information, such as

a distinctive voice and intonation, and the work of encoding is too complicated to be done manually. A component of the telephone directly transforms sound into an electrical code which is converted back into that medium by another component. Transmitting an image requires the encoding of more information than sound and also the direct conversion of light into an electrical code. The discovery of the photosensitive property of selenium in 1873 made this possible. Since selenium's resistance to an electrical current is reduced when it is exposed to light, the intensity of light striking this element can be determined by measuring the strength of the current leaving the selenium.¹² All attempts to transmit images have also had to break them down into a large number of visual elements consisting of uniformly coloured dots of light that produce an image only when they form a mosaic. The reconstituted pattern formed by the different coloured dots is the image¹³.

1. Antecedents and Prototypes

The first successful transmission of an image was achieved by Denis D.

¹² The description of the technical nature of mechanical television is drawn from Joseph Udelson, The Great Television Race: A History of the American Television Industry 1925-1941 (Birmingham: University of Alabama Press, 1982), George Shiers, 'Early Schemes for Television', IEEE Spectrum, 7, 5, (May 1970), pp. 24-34, and G.R.M. Garratt and A.H. Mumford, 'The History of Television', The Proceedings of the Institution of Electrical Engineers, 99, part III A (television), 20, pp. 25-42.

¹³ In what follows, I will use 'scene' to designate the object which the camera focuses on, and 'image' to designate what appears on the receiver's screen.

Redmond of Dublin in 1879. Redmond's camera consisted of a mosaic of selenium cells, and his receiver had the same number of lights as the camera. One cell was connected by a wire to the light in the same part of the screen as the cell in the camera mosaic. Each cell was insulated from its neighbours and had a separate electrical current passing through it. After passing through the selenium cell, the current ran to a light which was illuminated according to the strength of the current reaching it, the current being determined by the intensity of the light striking the selenium cell. If the selenium cell was exposed to intense light, electrical resistance of the cell was greatly reduced, and a stronger current travelled from the selenium to the light, causing more light to be emitted. Consequently, each cell-light pair reproduced the light intensity that was detected from the corresponding section of the scene, and distinctive images were formed by the pattern of lit and unlit lights in the receiver.

Redmond was able to transmit simple, luminous objects, but his methods and materials did not allow him to transmit complex or moving images. Because each cell required a separate connection (or channel) to a light in the receiver - an adequately defined image required 367,500 cells - the number of wires needed to connect the camera with the receiver made the connection extremely bulky and impractical. Moreover, neither the invention of the coaxial cable nor the discovery of radio waves allowed for multi-channel transmission. Although coaxial cables had a greater capacity to carry electrical codes than the telephone wires of 1879, hundreds of coaxial cables would have been required to carry the electrical code for one moving

image. Since each channel required its own frequency band, there were never enough radio wave bands to accommodate the transmissions of Redmond's apparatus. In short, multi-channel transmissions that provide a well defined image simply cannot be sent using radio waves. Another weakness of Redmond's system was that selenium cannot effectively convert moving scenes into changing electrical impulses. When a selenium cell is exposed to light and the light is then dimmed, the resistance of the selenium does not increase instantaneously, but slowly. While the resistance of the selenium in the camera is slowly changing, the image in the receiver will blur along the path of the motion.

Although there was no alternative to selenium for another 34 years, suggestions to scan an image sequentially, and thus avoid the impracticality of multi-channel transmission, were proposed in the early 1880's. The purpose of scanning is to break down the scene into a large number of elements, encode the light from each element, and sequentially transmit the code for each element along a single channel. The receiver converts the electrical code back into light, one element at a time, in the correct part of the screen. If the image is scanned quickly enough, a complete image will appear to have been transmitted because of the persistence of vision, even though only a single element is actually transmitted at a time.

Although he never built a television set, Paul Nipkow designed the mechanical scanning technique that was used in the first working television system in 1884. The scene is scanned by a rotating disk with a spiral of perforations and light from a small part of the scene shines through one of the perforations on the disk to a

selenium plate. An electrical current runs through the plate, its strength determined by the intensity of the light striking the plate. The current then runs to a light source in the receiver which emits light of an intensity proportional to the strength of the current. The emitted light shines through a perforation in the scanning disk in the receiver to illuminate the part of the viewing screen that corresponds to the part of the scene being scanned by the disk in the camera. The two disks must be synchronized to ensure that the light from one part of the scene is reproduced in the same part of the image. The entire scene is electrically encoded when the perforations have been aligned by the rotation of the disk with all parts of the scene. The electrical impulses from each picture element must follow rapidly so that the persistence of vision makes it appear that the picture elements are transmitted simultaneously (see figures 1-3).

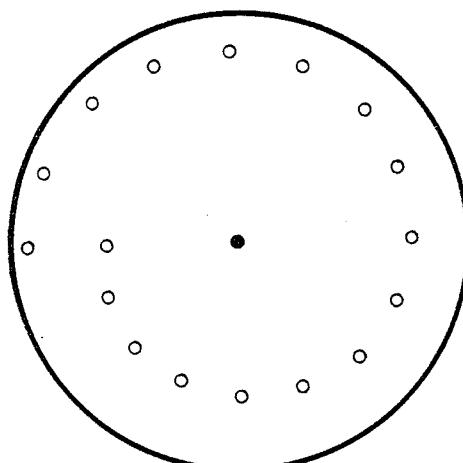
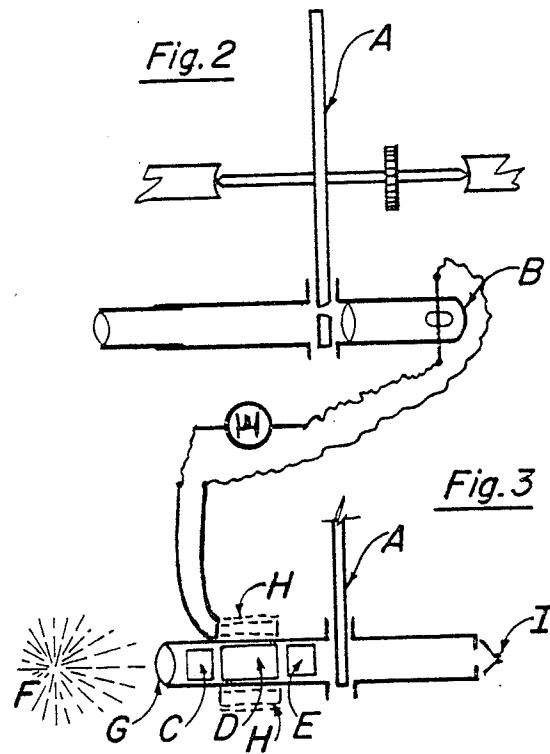


Fig. 1



Nipkow's system could not be implemented for over forty years because there was no suitable photosensitive substance to replace selenium, and no light could meet the demands of Nipkow's receiver. But more significantly, for our purposes, interest in the electrical transmission of images seemed to wane until after 1918. Although the technical means for television had been discovered, they were not made specifically for television. The development that was to be crucial for the future of television was the establishment of radio broadcasting.

2. The Origins of Broadcasting

Television was the first medium designed specifically to be a broadcast medium, i.e., a medium that transmits varied messages of public interest to individuals in their homes. Although it was devised with another purpose in mind, broadcasting was suggested as a use for the telephone, which was invented by Alexander Graham Bell in 1876. Bell was one of many prospective inventors trying to improve upon the telegraph. The telegraph had revolutionized communication by 1876; almost the entire world was connected by underwater lines, telegraphs could print messages themselves, and the wires could carry several signals in both directions simultaneously. Telegraphs had also taken on specialized uses, such as in city fire alarm systems and as a signal device in the home to summon the police or a messenger. Bell was attempting to find a way to send more messages along a single

wire when he invented the telephone.

The use to which a telephone could be put was not immediately self-evident. In fact, the dominance of the telegraph in telecommunications was such that many could not see the potential of the telephone. Western Union, the company that dominated the telegraph in the U.S., refused to buy the patent to the telephone, because, in the words of the company president, "What use could this company make of an electrical toy".¹⁴ Consequently, Bell had to create a use for the telephone in order for him and his backers to recoup their investment. Early in 1876 Bell was using two different telephone apparatuses; one was more effective for transmitting, and the other was more effective for receiving. Two-way conversation, consequently, was possible only at a short distance and the system was best suited for one-way communication. Recognizing these inherent limitations, Bell publicized the telephone as the 'telegraphing of musical sounds', and transmitted music in his lecture-demonstrations. The possibility of receiving music and speech in the home seems to have caused both public apprehension and excitement. For example, a sketch called "Terrors of the Telephone" printed in the New York Daily Graphic in 1877 depicted a demagogue speaking to the world through a telephone. On the other hand, a popular song of the same year praised the telephone in these words:

¹⁴ Sidney H. Aronson, 'Bell's Electric Toy: What's the Use? The Sociology of Early Telephone Usage', in The Social Impact of the Telephone, ed. Ithiel de Sola Pool (Cambridge, Mass.: MIT Press, 1977) p.16.

You stay at home and listen
To the lecture in the hall,
Or hear the strains of music,
From the fashionable Ball.¹⁵

Two cartoonists working independently of one another, George duMaurier in 1879 and Albert Robida in 1882, also anticipated broadcasting by portraying families in their homes viewing such events as sports, dances, lectures, and wars on large television screens.

The broadcasting potential of the telephone was not to be realized in the United States. While the quality of sound reproduced by a telephone in 1876 was adequate for conversations, it was not suitable for transmitting music because, unlike sentences in a conversation, parts of music cannot be repeated when the sound is temporarily obscured. Also, the sounds of different musical instruments could not be distinguished from each other after they had been reproduced by a telephone. Because Bell envisioned using the telephone primarily for two-way conversations, and this was possible by the end of 1876 - he ceased emphasizing its broadcasting potential.¹⁶ But there were later attempts in Budapest and London to broadcast news, lectures, and music over telephone lines. The system in Budapest broadcasted between 1893 and 1918, but the cost of buying telephone lines allowed only the affluent to subscribe. Despite the criticism of the American Telephone and Telegraph Company (AT&T) by the Electrical Engineer Magazine for not exploiting

¹⁵ Erik Barnouw, A Tower in Babel: A History of Broadcasting in the United States, Volume 1 = to 1933. (New York: Oxford University Press, 1966) p.7.

¹⁶ Aronson, op. cit., pp. 21-22.

the possibilities of "furnishing of musical and other entertainments by wire at the fireside"¹⁷, no such service was established in the United States.

It is likely the AT&T ignored broadcasting because providing two-way communication became extremely profitable and the potential profitability of the former was uncertain. The cost of renting a telephone was beyond the means of most families, and telephones were almost exclusively used by businesses throughout the 19th century. The telephone replaced the telegraph for local communication largely because telephones do not require skilled operators, but it did not replace the telegraph in long-distance communication until the twentieth century.

The Radio

The wireless radio, invented by Guglielmo Marconi in 1896, was first used for maritime communications, i.e., ship-to-ship and ship-to-shore. The world had long since been connected by telegraph lines and, to a lesser extent, telephone lines. But ships still relied on semaphore flags which limited communication to the range of sight. Wireless radio provided vessels with a method for communicating over long distances for the first time. The weakness of the radio when it is used to convey a private message to a specific person is that many others can also receive the message and other transmissions can interfere with it. But since ships did not have the option of communicating through wires, both navies and shipping lines were quick to place

¹⁷ Barnouw, op. cit., p.8

radios on their ships¹⁸.

Marconi's British company incorporated a subsidiary, American Marconi, to operate radio communications in the United States. American Marconi had a virtual monopoly on maritime communication because it owned the rights to the original radio patents. The improvement of the radio that allowed sounds to be transmitted encouraged a group of amateurs to use radio waves solely for enjoyment. The amateurs transmitted as well as received. When the navy and American Marconi had the only transmitters, the use of radio waves was easily coordinated and there was little interference. But the amateurs disrupted the order and were often blamed for interfering with commercial and military transmissions. In fact, the amateurs actively sought out other operators to converse with which sometimes made it impossible for official messages to be received. Consequently, the navy lobbied the government to regulate radio, and successfully pressured Congress into passing the Radio Act in 1912. This act empowered the Secretary of Commerce to license all transmitters and operators, and to assign the wavelength and time at which an operator could transmit. The Radio Act also divided the radio wave spectrum into three sections which were allotted to the amateurs, the commercial operators, and the military.¹⁹

Amateur radio operators were the main source of technical innovations before the First World War. Typically, the patents for these innovations were bought by larger companies, most notably General Electric and Westinghouse, which weakened

¹⁸ Udelson, op. cit., p.5.

¹⁹ George Gibson, Public Broadcasting: The Role of the Federal Government (New York: Praeger Publishers, 1977) pp. 4-5.

the patent monopoly of American Marconi. By the time war broke out, producing radios involved complicated negotiations over patent licenses and patent infringements. The entry of the United States temporarily alleviated the problems of the patent stand-off and the continuing problem of interference. All transmitting equipment belonging to amateurs was impounded until the end of the war, and the government suspended private patent rights to provide equipment for the allied forces without legal difficulties. The military and large radio manufacturers believed that the only permanent solution to the chaos in the radio industry was a monopoly, although they did not want this to be foreign owned, as American Marconi had been. The plan that was agreed upon after the war was the creation of a government sponsored monopoly to be controlled by the largest domestic manufacturers of radio equipment. As a result the monopoly called the Radio Corporation of America (RCA) was formed in October 1919, when General Electric, AT&T, and the United Fruit Company bought American Marconi and formed a patent pool for RCA. RCA began as a sales agent for General Electric and AT&T radio equipment and continued to operate American Marconi's maritime communication system.²⁰

The Development of Commercial Broadcasting

The extensive use of radios in the First World War led to a large growth in the production of components. This productive capacity became idle when the military ceased ordering parts at the end of the war. Consequently, electronics

²⁰ Barnouw, op. cit., p. 47.

manufacturers searched for new markets for their products. In 1920, an amateur operator who worked for Westinghouse first began to sell complete radio receiving sets and transmitted music regularly to encourage people to buy his receivers. Westinghouse became aware of this, invited the employee to construct a transmitter, after which the company began selling receivers. With this development, broadcasting became established in the United States. Since many receivers were sold, the other manufacturers began to imitate Westinghouse which was invited to join the RCA group. The profits from receiver sales were sufficient to pay for programs as long as the number of sets sold was increasing. Because the cost of programs was escalating and an end to the boom in receiver sales was inevitable, the radio manufacturers realized that a new method of paying for programs would have to be devised.²¹

Several schemes for financing radio broadcasting were suggested in the early 1920's. For example, one was to encourage wealthy philanthropists to endow radio stations, as Andrew Carnegie had done for public libraries. But no such philanthropists were found. Another suggestion was that municipal and state governments should pay for broadcasting. This was implemented in the case of university stations, but was resisted by many station owners. Although radio manufacturers owned the first and largest stations, many were owned by newspapers and department stores who used them for promotional purposes. Their owners resisted government financing since it would have deprived them of a commercial

²¹ Ibid, p.70, p.105.

tool. For this same reason, the scheme to finance broadcasting from license fees, such as in Britain, was opposed. David Sarnoff, the general manager of RCA, proposed that the radio industry place a levy on the sale of radio equipment which would be used to finance a broadcasting organization. But the radio industry was in the midst of bitter competition, including litigation, and was in no mood to cooperate in this manner.

Meanwhile, AT&T began renting its transmitters to sponsors. Its strategy for radio imitated the one it employed for its telephone service; anyone could rent its telephone lines and transmitters to broadcast what he or she pleased. This procedure did not attract sponsors because there was not an audience already amassed. As a result, AT&T reluctantly began to produce and transmit programs, some of which were paid for by advertisers. Over the next several years, sponsors were attracted to radio because AT&T could provide a national audience for their advertisements, which it was able to do by connecting stations with its telephone lines. Commercial sponsorship through paid advertising turned out to be a way to make a profit from programming alone, and this system of commercial broadcasting became the model for both radio and television. Thus, commercial sponsorship allowed a new type of organization to enter the broadcasting industry - the networks.²²

The Networks

The introduction of commercial broadcasting by AT&T precipitated a conflict

²² Ibid, p.109, pp. 155-157.

among the RCA partners. AT&T began broadcasting from its station in New York City (WEAF) in 1922 and in the following year connected it with other stations across the country using its telephone lines. AT&T was forbidden, or at least its RCA partners thought so, to broadcast by the RCA agreement. AT&T argued that commercial broadcasting was radio telephony and it was merely renting out its transmitters and lines as it did with telephones. Consequently, it should be able to both broadcast and sell radio receivers since it also sold telephones. RCA tried to follow AT&T's lead by forming a network using Western Union telegraph lines, but failed because the telegraph lines were not built to carry sound codes, thus compromising sound quality. Meanwhile, although AT&T remained in the patent pool, the company sold its interests in RCA. The conflict between AT&T and the RCA group was resolved in 1926 when AT&T agreed to stop broadcasting and sell WEAF to RCA. In return, RCA signed a long term contract to use AT&T lines. To operate its now enlarged broadcasting network, the RCA group incorporated the National Broadcasting Company (NBC).²³

At first, NBC did not make a strong effort to attract sponsors and maintained that broadcasting was a public service, but this policy changed in the light of declining receiver sales and increasing competition. A rival network, the Columbia Broadcasting System (CBS), emerged soon after NBC was incorporated. Unlike NBC, CBS was avowedly commercial because it could not profit from receiver sales and had to rely exclusively on advertising revenues. The boom in receiver sales that

²³ Udelson, op. cit., pp. 6-8, and Barnouw, op. cit., pp. 160-161, pp. 184-185.

began in the early 1920's had ended by 1930 and NBC was compelled to generate a profit since RCA's sales had declined.

CBS was able to gather affiliates including some stations formerly affiliated with NBC. NBC paid affiliates \$50 per hour for the sponsored programs that the affiliate chose to broadcast, and charged the affiliate \$45 per hour for unsponsored, or sustaining, network programs. The NBC affiliate was under no obligation to broadcast either sponsored or sustaining programs. CBS, on the other hand, paid affiliates to carry sponsored programs, but provided sustaining programs free. CBS also had the right to demand, for a fee, some part of the affiliates time enabling it to guarantee a national audience to its sponsors, something NBC was unable to do. With free sustaining programs and guaranteed national coverage, the CBS-affiliate arrangement was more attractive to both affiliated stations and sponsors than the NBC agreement.²⁴

3. Government Regulation of Radio

As a broadcast medium, television was affected by a set of government policies that had been enacted to regulate radio broadcasting. These policies were to form part of the environment in which television was to develop. The regulations and the official agencies given the authority to implement them arose out of

²⁴ Barnouw, op. cit., pp. 250-253.

problems encountered during the development of radio broadcasting.²⁵

When Westinghouse began to broadcast, the Secretary of Commerce assigned the 360 meter wavelength to broadcasters. The marketing of complete receiver sets in the early 1920's led to a proliferation of broadcasters and necessitated the sharing of frequencies. Herbert Hoover, the Secretary of Commerce between 1921 and 1928, allowed broadcasters to decide among themselves when each would broadcast. This arrangement worked for the most part, though there were instances of one station sabotaging another's air time or by transmitting at a frequency slightly above or below their assigned frequency. While this reduced the interference between broadcasters, other types of radio were disrupted. In 1922, Hoover asked the radio industry how his regulatory powers should be used to prevent sabotage and minimize interference. The industry urged Hoover to take effective control of broadcasting, but it could not agree on what Hoover should do with his power.

Hoover temporarily allayed the overcrowding of the 360 meter frequency by allowing broadcasters to transmit between the 300m and 545m frequencies. The new frequencies were available only to higher powered stations that did not broadcast phonographic records. The result was that large, well-financed stations, such as those owned by members of the RCA group, were allocated clear channels, while smaller

²⁵ The description of the regulation of radio is drawn from Udelson op. cit.; Barnouw, op. cit.; Gibson, op. cit.; E. Pendleton Herring, 'Politics and Radio Regulation', Harvard Business Review, 13, 2, (January 1935) pp. 167-178; and Carl J. Friedrich and Evelyn Sternberg, 'Congress and the Control of Radio-Broadcasting, I & II', American Political Science Review, XXXVII, 5-6, (October - November 1943), pp. 797-818, 1014-1026.

stations had to share the still cluttered 360m frequency. The demand for stations increased during 1924 and 1925 and Hoover was urged by broadcasters to stop issuing new transmitter licenses and reduce the number of stations. When he complied with their wishes, the practice of buying stations with licenses became commonplace.

The Radio Act of 1912 was ambiguous about the power of the Secretary of Commerce to deny an application for a transmitting license. Hoover was aware of this and had repeatedly pressed Congress to enact a new law that would make explicit the power of the government to regulate radio. But Congress did not act until it had no other choice. This occurred when Zenith, a radio manufacturer, unsuccessfully applied for a license in 1926. Zenith challenged Hoover's legal authority to do this and won the case when it went to court, after which Hoover's allocations were ignored by all and the frequency situation was chaotic. As a result, Congress quickly passed the Radio Act in January 1927 to reimpose order in broadcasting. An independent agency, the Federal Radio Commission (FRC), was established as the licensing authority with the power to allocate frequencies, times, signal strengths, and licenses. The commission was to rule on these according to what was in the 'public interest, convenience, and necessity', though the FRC was forbidden from censoring programs. Moreover, monopolistic practices were made grounds for revoking a license.

When the FRC began to review licenses in 1927 it was at a disadvantage, having no files, support staff, or budget. The commission was also very sensitive to

political pressure because Congress could abolish the FRC, replace the commissioners, or veto any of its decisions. These conditions made the FRC timid, and it avoided conflict with the industry for a decade. The Radio Act itself also served to neutralize the FRC, because the criteria of 'public interest, convenience, or necessity' were too vague to be applied to programs, especially when censorship was explicitly prohibited. The only area in which this stipulation could be applied unambiguously was the strictly technical aspects of broadcasting. Consequently, the FRC's decisions with regard to the public interest were based upon the technical quality of the station in question, which effectively resulted in the favouring of well-financed, commercial stations over non-profit broadcasters. At the same time, although monopolistic practices were proscribed, the Act did not spell out what constituted a monopolistic practice in broadcasting.

The FRC believed that advertising support for broadcasting was essential and that non-profit broadcasters had no special claim to serve the "public interest, convenience, or necessity". Many non-profit stations had their licenses revoked or their times and strengths reduced because they were not able to buy the best transmitters. The way in which the FRC resolved disputes also favoured wealthier stations. For example, if a commercial station applied to broadcast full-time when it shared a wavelength with a non-profit station, both parties would be asked to send representatives to the FRC. Both stations would have to pay legal and travel expenses, which clearly placed non-profit stations at a disadvantage. Even if the FRC ruled in favour of the non-profit station, the financial ability of the station to

continue broadcasting would be diminished. Thus, the main effect of the Radio Act of 1927 was to strengthen the hold of the networks and the commercial stations over broadcasting. The government was compelled to intervene in broadcasting because there were fewer frequencies available than prospective broadcasters. Since radio waves were officially a public resource, the government was responsible for frequency allocation. The government, whether intentionally or not, used its control over the allocation of frequencies to make broadcasting more commercial.

4. The First Television

At the turn of the century, two components necessary for the construction of the television system had yet to be invented: a light source for the receiver and a photosensitive replacement for selenium. The photosensitive property of potassium hydride was discovered in 1913 and, unlike selenium which is photoconductive, the former is photoemissive. In other words, light striking potassium hydride causes it to emit electrons in proportion to the intensity of the light, i.e., the brighter the light striking the potassium hydride, the more electrons it emits. Potassium hydride is superior to selenium as a means to electrically encode light because it is more sensitive to variations of light intensity. It also changes the rate it emits electrons as quickly as the intensity of the light changes. A mechanically scanning television system, such as Nipkow's, requires a single light source in the receiver that precisely and quickly changes its brilliance. Such a light must be electrically modulated in order for its brilliance to change with the slight differences in strength of the

electrical current coming from the transmitter. The light in the receiver must also modulate its intensity quickly, since even a television with poor picture quality requires a receiver light that can have its brilliance changed several hundred thousand times a second. An electrically modulated light was invented by an engineer working for General Electric in 1917.

The first television systems were invented independently by John L. Baird in Britain and C. Francis Jenkins in the United States in 1925, and both used the Nipkow disk to scan. In April 1927, AT&T publicly demonstrated its television system to representatives of the press. The event was widely reported and stimulated interest in both the public and various businesses involved with the radio industry. With the profitability of radio already established, the successful demonstration of the television led to more investments than earlier.²⁶

The ambiguity about television's use was being resolved shortly after the AT&T demonstration. The cartoonists, DuMaurier and Robida, anticipated in the 1880's that television would be used to broadcast. In 1923, David Sarnoff of RCA suggested that television be used to transmit movies and news to homes or auditoriums. He envisioned television complementing and extending radio broadcasting, i.e., radio augmented by pictures. The new medium was clearly expected by Sarnoff to become a broadcasting medium, since it would transmit varied messages of general interest to an unspecified audience which would receive the messages in the home. An article in Collier's in 1927 presented another vision

²⁶ Udelson, op. cit., pp. 24-28.

of the use of the electrical transmissions of moving images. The writer emphasized the possible use of television as a device enabling people to see one another as they spoke on the telephone.²⁷ A demonstration by AT&T showing Herbert Hoover speaking on the telephone also seemed to view television as essentially augmenting the telephone.²⁸ But most of the other discussions of television assumed that, like radio, it would be used publicly and not be limited to private or two-way communication.

Investment in television experiments increased after AT&T's demonstration had identified it with radio broadcasting. Television was expected to be as profitable as radio had been and many people believed that it would become commercial in the next few years. In addition, radio manufacturers were seeking new markets and began to experiment with television equipment and broadcasting in the late 1920's. Radio stations and networks such as Don Lee (a large Los Angeles station) and CBS began experimental broadcasts soon afterwards. Since they expected television to develop rapidly, they undertook further research in order to obtain station licenses and develop the expertise to produce programs.²⁹

Despite the expectations of companies experimenting with television, the Federal Radio Commission would not allow commercial broadcasts. Because it was

²⁷ Walter Davenport, 'Face to Face by Radio', Collier's, (July 23, 1927) p. 13.

²⁸ 'Far-Off Speakers Seen As Well As Heard Here in a Test of Television', New York Times, April 8, 1927.

²⁹ Udelson, op. cit., pp. 30-40.

to be a broadcast medium, the FRC insisted that any television receiver be able to receive any broadcast. Until 1928, various broadcasters transmitted signals for different receivers but none of the latter were compatible with all transmissions. The FRC called upon the Radio Manufacturers Association to come up with uniform standards for television transmissions. The association members agreed that an image should be scanned from left to right, top to bottom with fifteen frames per second and 48 lines per frame, and 60 lines as a secondary frame.³⁰ The FRC rejected these standards for two reasons. First, by allowing transmissions at both 48 and 60 lines per frame, the manufacturers contravened the purpose of uniform standards. Second, because it was defined as an entertainment medium, the FRC believed that television had to have a picture quality comparable to that of movies, and neither 48 nor 60 lines achieved this quality. The commission feared that if it accepted the proposed standards either the picture quality would not be improved, or that the public would invest in receivers that would soon become obsolete.³¹

Electronic Television

Manufacturers began marketing receivers in the early 1930's. But even though the novelty of television led to a boom in investment and transmissions, few receivers were sold. Investors had expected quick profits, but these were not

³⁰ The number of lines refers to the number of horizontal rows of picture elements in the image. It is generally true that the greater the number of lines, the more clearly defined the picture.

³¹ Udelson, op. cit., pp. 45-46.

forthcoming because neither the FRC nor the public accepted the picture quality of mechanical television. Forty-eight line picture definition was incapable of allowing for programs of sufficient entertainment value to induce the public to buy receivers. Consequently, the manufacturers of receivers could not profit, nor could stations get commercial sponsorship. It became clear to such companies as RCA and Philco that television technology would have to be drastically improved before it could become popular or profitable.

The failure of mechanically scanning television to produce a sufficiently defined picture led many researchers to consider electronic scanning as the only suitable method of producing a satisfactory picture. Although efforts to improve mechanical scanning continued, the larger companies sought to make television completely electronic, and the most encouraging improvements were in the latter method. Designs for an electrically scanning television existed as early as 1908 and in 1923 Vladimir Zworykin applied for a patent for his method. Zworykin had been a communications expert in the Russian army and had emigrated to the United States in 1919. After arriving, he began working on television at Westinghouse, but left owing to the company's ambivalence with regard to his research. Zworykin returned to Westinghouse in 1923 where he remained until he was transferred to RCA in 1929.³²

³² The description of electronic television is drawn from Udelson, op. cit. and Robert H. Stern, The Federal Communications Commission and Television: The Regulatory Process in an Environment of Rapid Technical Innovation (New York: Arno Press, 1979).

Zworykin's television system is the effective prototype of modern techniques, although most of its components have been changed, improved, and refined. The central items are two cathode ray tubes, one in the camera and the other in the receiver. The cathode ray tube in the camera contains a plate with a large number of globules of photo-emissive substance on it. When light strikes the globules, they take on a positive charge according to the intensity of the light striking them. In other words, the photo-emissive substance emits electrons when exposed to light. A scene is scanned by activating the photosensitivity of the globules one by one. A stream of electrons strikes one globule, which accepts enough electrons to give it a neutral charge, and gives off electrons in proportion to the intensity of the light striking it. The electrons that have been emitted from the globule are collected at the back of the plate, and run out of the tube to the transmitter. The stream of electrons is then electrostatically aimed at the next globule to give it a neutral charge so that it will emit electrons.

The transmitter converts the varying electrical impulses from the camera tube into radio waves. The radio waves are decoded in the receiver into a series of impulses similar to the series that had travelled between the camera tube and the transmitter. The electric current in the receiver then enters the second cathode ray tube in which the electrons are aimed at a fluorescent screen which gives off light in keeping with the number of electrons that strike it. The electron stream in the receiver must be synchronized with the electron stream in the camera so that the

light detected in one part of the plate in the camera tube is reproduced in the same part of the fluorescent screen in the receiver (see figures 4 and 5).

Figure 4

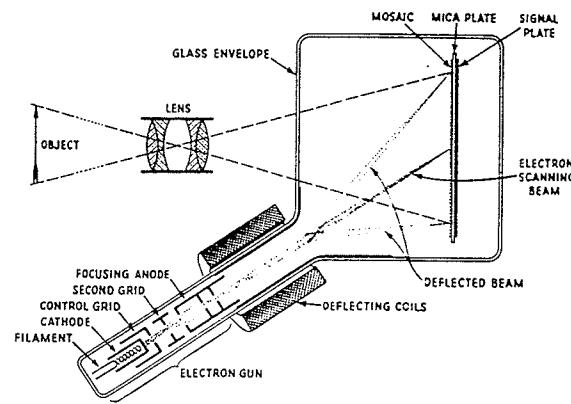
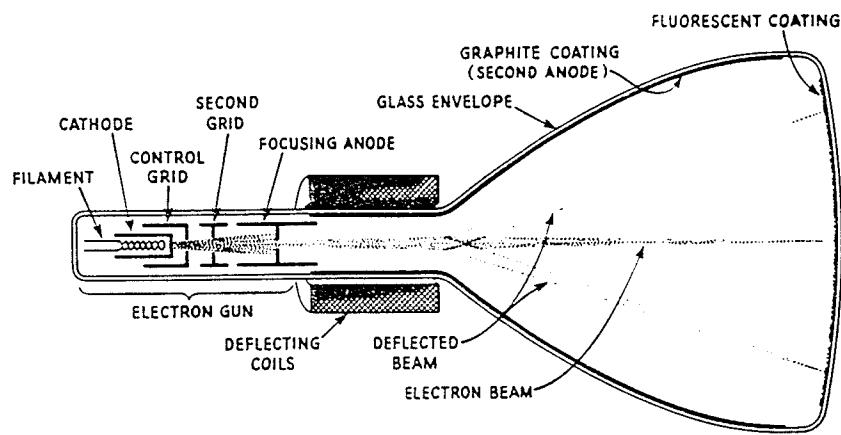


Figure 5



Since electrically scanning televisions could produce a better picture than

mechanically scanning ones by 1932, the focus of television research changed. Moreover, the change from mechanical to electronic scanning introduced new and powerful actors to television research. Thus, the multitude of small companies that relied on the work of a single inventor were, for the most part, forced out of the industry by the mid-1930's. This occurred because a different set of patents with different owners came to the fore, and research in electronics proved to be extremely expensive. These changes effectively prevented companies with little money from investing in the necessary research and two companies, RCA and Farnsworth, dominated the development of electronic television because they held most of the key patents. RCA owed its strong position to its original monopoly of radio patents, patents on improvements of cathode ray tubes that were registered in the 1920's, and those obtained from Zworykin's research. By contrast, Farnsworth, whose patents were obtained from the research of the inventor Philo Farnsworth, was organized as a patent holding company. It sought to generate revenue by licensing manufacturers to use its patents, and not, as RCA had, through manufacturing.

5. Technical Improvements and Regulation

Although the experiments in the early 1930's were encouraging, they demonstrated that television had to be improved considerably before it could become profitable. By widely publicizing the allocation of a million dollars to field tests of television in 1935, RCA was able to begin improving electronic television

and arouse public interest. The Federal Communications Commission (FCC) was prodded by RCA's attempts to market the new medium to establish a policy to regulate its future development.³³ The Radio Manufacturers Association was again asked to establish a set of standards for television and it complied. But these were rejected by the FCC on the grounds that they were based upon the technical levels that had already been achieved by 1935. The FCC contended that television was not sufficiently developed for commercial broadcasting and that if it were to accept the proposed standards it would inhibit necessary technical improvements. Since it was to be a broadcast medium, the public would have to buy receivers that were at risk of becoming obsolete as the technology improved. Consequently, as the FCC reasoned, television would have to be perfected before it would be allowed to have established standards and become commercial. The Commission did, however, allocate television some frequency bands in the Very High Frequency range of the radio wave spectrum.³⁴

Television interests were eager for commercial authorization and spectrum allocations because they wanted radio wave channels. The demand for channels had exceeded the available range since the early 1920's when, as we saw, Hoover had to stop issuing transmitting licenses. Although more of the spectrum was used during

³³ The FCC was the successor to the FRC. The Roosevelt administration created the FCC in 1934 to place radio and telephone regulation under the same authority. The 1934 Act did not substantially change the regulations governing radio and television.

³⁴ For the regulation of television, see Udelson, op. cit., Barnouw, op. cit. and Stern, op. cit.

the next twenty years, the demand for frequency bands grew even faster. Any new users of radio waves inevitably found themselves in competition with others for scarce frequency bands.

Edwin Armstrong had invented FM radio in 1933. Because the sound quality of FM transmissions was clearly superior to that of other contemporary transmissions, RCA invited Armstrong to test his system at its facilities in 1934. But RCA asked Armstrong to remove his equipment shortly before the company announced a million dollar commitment to television tests. It is likely that RCA decided that television would, in the long term, be more profitable than FM. Moreover, RCA would have had to spend a great deal of money to re-equip NBC for FM which could not be recovered until the public had purchased FM receivers. Since it could not convert to FM and develop television simultaneously because television research was being subsidized by network radio profits, the company had to choose between the two. RCA decided to invest its resources in television and bypass FM radio. Nevertheless, Armstrong continued marketing his radio system, which included petitioning the FCC for frequency bands. David Sarnoff of RCA resisted Armstrong's application by asking the FCC to increase its allocations to television and limit the expansion of FM broadcasting. Sarnoff asserted that television was indeed ready for commercial broadcasting and merely required sufficient spectrum space to operate. Although the FCC ruled temporarily in favour of television and RCA, the conflict between the two new users of radio waves was not yet over.

Nor was RCA's victory complete because it was denied commercial authorization on the grounds of poor picture quality. Moreover, shortly after embarking on extensive field tests, RCA became aware that Zworykin's original system could not provide a picture of the quality necessary for commercial television. The patent policies of the two major companies were a barrier to improving the technology. As noted earlier, Farnsworth was organized as a patent holding company whose revenue was generated from license fees levied on manufacturers for the use of its patents, and Farnsworth refused to sell the rights to its patents. RCA's policy was to purchase the rights to any patents it needed and never pay license fees. This patent standoff denied Americans a superior camera tube that was being used in Britain and Germany. The British and German governments compelled the subsidiaries of RCA and Farnsworth to come to a cross-licensing agreement that allowed the patents of both companies to be incorporated into a camera tube. The government of the United States, including the FCC, refused to legislate such a patent pool and thus, the production of this tube was delayed for several years in the U.S.. This situation lasted from 1931 to 1939 when RCA finally submitted to pay license fees to Farnsworth. The solution to the patent impasse was likely motivated by RCA's intensive efforts to have commercial status granted to television.

By the beginning of 1939, the major business interests in television were eager to recover their investments. (see Table 1)

Table 1

Expenditures on Electronic Television to 1939

<u>Company</u>	<u>Period</u>	<u>Total Expenditure (\$)</u>
RCA	1930-39	9,254,000
Farnsworth	1929-38	1,034,000
Philco	1932-39	1,000,000*
GE	1935-39	2,000,000*
CBS	1936-39	1,312,000
DuMont	1931-39	275,000

But the FCC still adamantly refused to set standards and grant commercial status to television because the Commission believed the medium had to be technically improved. RCA sought to force the issue of standards by encouraging the sale of receivers to the public. If the public bought enough receivers, RCA thought, the FCC would have to accept the standards of these receivers because the Commission would not allow the purchased receivers to become obsolete. Also, high receiver sales would demonstrate to the FCC that the public accepted television and that no further technical improvements were necessary.

Setbacks

The World's Fair of 1939 in New York City provided RCA with an

opportunity to begin regular television broadcasts and to publicize its product. The publicity included an elaborate demonstration at the fair of the television system, complete with mobile camera units. Soon after, both RCA and Dumont began to sell receiver sets. In 1940, CBS and Dumont also began broadcasting regularly and 23 stations were broadcasting throughout the country by May. The FCC partially alleviated the financial burden on broadcasters by authorizing 'limited commercial operation' for television, which meant that stations could invite sponsors to pay for and produce experimental programs although a station could not sell time.

Despite an opinion poll that revealed that one family in eight would consider purchasing a television receiver, fewer than a thousand sets were sold in 1939 instead of the twenty to twenty-five thousand that RCA had hoped to sell. The inability to sell receivers was related to the technical shortcomings of the system. The FCC had allocated frequency bands in the Very High Frequency range of the spectrum, which was little used in 1939. Unlike the radio waves used for standard radio broadcasts, VHF waves have a range limited to a line of sight and do not pass through large, dense objects. Consequently, VHF waves deflect off buildings causing "ghosting" or blurred images. Another difficulty with VHF waves is that many devices such as automobile ignition systems, elevators, and industrial heating systems, produce them and thus interfere with transmissions.³⁵

The camera tube used in the television system in 1939 was not yet sensitive enough to light to allow for many types of programs - bright light was necessary to

³⁵ 'The Promise of Television', Fortune, XXVIII, 2, (August, 1943) pp. 202-204.

affect the photo-emissive plate in the camera so programs usually had to be made in a studio. The camera also had a narrow depth of focus that sharply restricted motion if the whole scene was to remain in focus. The design of the camera also caused considerable spurious shading. The quality of a television picture in 1939 seems to have fallen below the minimum level the public would accept. The limited program content and the eye strain associated with television viewing also hampered receiver sales. Even if television had been granted full commercial status, it is unlikely that it would have been profitable at that time. Moreover, the limited audience and the high cost of programs (between twenty and thirty thousand dollars per hour) did not make it attractive to advertisers. Finally, there was no method of conveying a program from one television station to another which meant that all programs had to be produced at the station that broadcast them. Without a network of stations, there could be no easy national advertising through television, a technical drawback that made it even less attractive to advertisers.³⁶

There were, however, proposals for connecting television stations into a network. AT&T had developed the coaxial cable which was capable of carrying television signals and had linked New York with Philadelphia. But coaxial cables were very expensive and AT&T would not add any more cities until they were certain that someone would rent them. RCA proposed a network link using a string of relay stations between cities. Each station would automatically receive and then retransmit the message on to the next station, until the signal had reached the next

³⁶ 'Television I: A \$13,000,000 'If'', Fortune, XIX, 4 (April 1939) pp. 168-172.

city, where the signal would be broadcast. While the relay stations would have been less expensive than the coaxial cables, such a network link would have supported the accusations of an RCA monopoly since only one company could transmit at a time through these stations. The third suggestion was to film programs and send them to the individual stations. Although all three proposals were technically possible, they were also expensive. Advertisers were simply not willing to pay for the network until more receivers were purchased by the public. The industry was confronted with a related set of dilemmas. Until the picture quality was improved, receivers could not be sold, program sponsors could not be attracted, and network connections would remain too expensive to construct.³⁷

In 1940, RCA redoubled its efforts to sell receivers and to set standards by reducing the prices of their units. The other prospective television manufacturers urged the FCC to set higher standards immediately since large receiver sales would make existing standards immutable. The FCC, as it had always done, asked the manufacturers to agree upon standards. Meanwhile, the FCC received an influx of applications for television stations. Since it expected that stations would have to transmit for some time before they could generate a profit, the Commission granted licenses only to those applicants who could sustain financial losses for several years. Twenty-three stations throughout the country were transmitting by the end of 1940.

As television was encountering technical obstacles, FM radio was becoming popular. The FCC received 150 applications for FM stations in 1939 and it

³⁷ Ibid, pp. 180-82.

reallocated one channel to FM from television. General Electric began manufacturing FM receivers and the FCC authorized commercial broadcasts in May, 1940. Despite losing a channel to FM, the business interests behind television managed to stifle the growth of FM; large frequency bands were reserved for television, which effectively limited the number of possible FM stations. The networks refused to switch to FM, thus preserving the lower quality AM stations. FM radio ended up supplementing AM radio instead of replacing it altogether which was certainly possible had RCA sponsored the technological improvement.³⁸

For six years, the FCC had resisted pressure from the radio manufacturers to set standards and allow television to become commercial. Television had become part of the radio industry, which was dominated by a few companies. Powerful interests, especially RCA, believed that it was time for television to become a business whether or not the FCC thought it was ready. Referring to the Radio Act of 1927, RCA argued that it was no longer in the public's interest to delay the domestication of television - its time had come. But another part of the Radio Act was also about to come to the fore, which was the proscription of monopolistic practices.

Commercialization

The FCC finally accepted the standards proposed by the Radio Manufacturers

³⁸ Erik Barnouw, The Golden Web: A History of Broadcasting in the United States, Volume II - 1933-1953 (New York: Oxford University Press, 1968) pp. 129-130.

Association and granted full commercial status to television in July, 1941. Television was to have 525 lines per frame and 30 frames per second. By the time the United States entered the war in December, there were approximately ten thousand television sets in use. But the war delayed the mass production of receivers because all the productive capacity of electronics manufacturers was devoted to radar and military communications equipment.

The FCC also completed a three-year study of monopolistic practices in broadcasting in 1941. Under the Roosevelt administration, the Commission decided that it should foster competition in broadcasting. As a result, the FCC ruled that network affiliates could reject any network program they did not want to broadcast, no company could own more than one network, licenses were limited to one per person per market, no person or company could own more than six stations, and the owner of the only newspaper in a market could not own the sole radio station. Although small networks and owners of single stations approved of these stipulations, most of the industry opposed the rulings.

Because the FCC is empowered by Congress, the latter has sweeping rights to alter any Commission ruling and even dismiss its members. Consequently, the broadcasting industry lobbied Congress to overrule the decision and get rid of the chairman, J. L. Fly. The networks and stations had exerted political influence through direct cash contributions to congressmen and by giving free broadcast time to favoured politicians. Congress reacted to the pressure by initiating an investigation of the FCC itself. Despite being subjected to long and arduous questioning from the

investigating committee, Fly resisted all pressure to reverse the decision. The FCC decision was upheld when a member of the commission revealed evidence of payments by a radio station to the chairman of the investigating committee, and the investigation stopped amid charges of bribery and influence peddling. The results of the ruling were that RCA was forced to sell one of its networks, CBS had to change its affiliates agreement, and networks could no longer refuse to sell time to organized labour. The rulings designed to break regional media monopolies were never implemented.³⁹

Throughout the war, television was expected to become a great post-war industry. This optimism was not unfounded because of the technical improvements achieved during the war years. For example, the production of cathode ray tubes for radar increased the quantity and improved the quality of tubes similar to those used in television. Allan Dumont had also designed a receiver tube with a flat face which eliminated the distortion of images caused by curvature and directional antennas decreased the amount of ghosting. The most important improvement was the invention of the image orthicon camera by RCA engineers. Because this camera was almost as sensitive to light as the human eye, many more types of programs were possible, including those filmed outdoors. This device also eliminated the spurious shading characteristic of previous camera designs. RCA took the lead after the war by encouraging its affiliates to apply for television transmitting licenses and by promising that receivers would be available to the public by the middle of 1946.

³⁹ Ibid, pp. 173-176.

Meanwhile, advertising agencies established television departments in anticipation of program sponsors.

Two related issues needed to be resolved before television could become a mass medium. First, although CBS developed and demonstrated a method of broadcasting colour television during the war, these transmissions were completely incompatible with black and white receivers and thus one system had to be chosen over the other. Second, because the colour system required a wider band width since more information had to be encoded on radio waves, CBS wanted television placed in the Ultra High Frequency range where the wide band widths could be accommodated. RCA and the other large manufacturers wanted television to remain monochromatic and in the lower frequencies so that they would not have to replace their equipment or pay license fees to CBS for the use of the patents for the colour system. By contrast, the FM interests wanted the FCC to accept CBS' argument because television would then move to the higher frequencies, leaving the lower spectrum to FM transmissions.⁴⁰

In 1947, the president of RCA, David Sarnoff, promised that he would provide a colour system compatible with the existing system within six months. He seems to have convinced the FCC which, later in that year, ruled that the monochromatic system would be authorized to broadcast commercially in the lower frequencies. CBS was told that it could continue working on its colour system and the public could choose the system it preferred sometime in the future. FM was

⁴⁰ Stern, op. cit., pp. 255-256.

allocated more frequencies, but at a higher range and the FM stations built before the war had to replace their equipment. The 1947 ruling gave RCA what it wanted; commercial authorization for monochromatic television in the lower frequency range. Later in 1947, Charles Denny, the FCC chairman who presided over these decisions, became a vice president of NBC.⁴¹

⁴¹ Barnouw, The Golden Web, op. cit., pp. 242-243.

Television as a Broadcast Medium

III

Chapter 2 argued that the development and domestication of television was not simply a case of individuals and companies overcoming a series of engineering obstacles. Rather, technical problems were generated by a particular use of television and could have been avoided had the technology developed along different lines. For example, the related difficulties of picture quality and wavelength allocations would not have arisen if the medium had initially used cables and not radio waves. But these design features were incorporated because television had been conceived as an extension of radio broadcasting. This identification was made by a few electronics manufacturers specifically, RCA, AT&T, GE, and Westinghouse, who believed that they could profit from the sale of such a medium. This raises two questions relevant

to our inquiry: why were these manufacturers alone able to determine how television would be employed? And why did they develop it to be an extension of radio broadcasting?

1. Prototypes and Their Designers

Simply put, these few manufacturers were able to shape television because they alone had the resources to refine the technology sufficiently for it to be domesticated. But amateur inventors had tried to build prototypes forty years before the manufacturers became interested in the medium, and failed because its complexity posed problems that they could not solve. Nevertheless, they were able to come up with the technical principles that television relied upon, and some astutely anticipated its weaknesses. For example, in 1908, Shelford Bidwell argued that Nipkow's system for mechanical scanning could not provide sufficient picture definition for television to be useful.⁴² Later that year, A.A. Campbell-Swinton agreed with Bidwell and suggested that an all-electronic system using cathode-ray tubes would be satisfactory.⁴³ Thus, Bidwell and Campbell-Swinton foresaw the dramatic change in television research that would occur in the early 1930's.

Those designing televisions before 1925 are typical of a larger group of

⁴² Shelford Bidwell, 'Telegraphic Photography and Electric Vision', Nature, 78, 2014, (June 4, 1908) pp. 105-106.

⁴³ A.A. Campbell-Swinton, 'Distant Electronic Vision', Nature, 78, 2016, (June 18, 1908) p. 151.

nineteenth century inventors, as described by Thomas Hughes in American Genesis⁴⁴. Although none of those working on television were professional researchers, many worked in related fields, such as the natural sciences and electrical engineering⁴⁵. Others, however, worked in entirely unrelated professions, e.g., Constantin Senecq was a lawyer. They appear to have been motivated primarily by intellectual curiosity, although they were not oblivious to the possibility of earning money from a patent⁴⁶. But unlike Hughes's group, the early designers of television were not successful because they could not find a suitable photosensitive substance, design a modulating light, or overcome the many problems of refinement that thwarted the medium's development.

Hughes argues that the most successful 19th century inventors were able to exploit a single technical principle, which allowed them to overcome crucial obstacles in a range of technologies. For example, Thomas Edison's incandescent lamp, phonograph, and streetcar are all devices that convert energy into different forms, e.g. electrical energy into light or motion. Edison's mastery of energy conversion allowed him to design and improve a range of technologies that relied in some way on this principle⁴⁷. But the obstacles faced by television did not rest on similar

⁴⁴ Thomas Hughes, American Genesis: A Century of Invention and Technological Enthusiasm, (New York: Viking, 1989).

⁴⁵ Nothing is known about some of these early designers, e.g., Denis Redmond.

⁴⁶ George Shiers, 'Early schemes for television', IEEE Spectrum, 7, 5, (May 1970), pp. 25-33.

⁴⁷ Ibid, pp. 67-70.

considerations. The construction of a modulating light required a knowledge of electro-magnetism and electrical engineering, whereas the discovery of a photosensitive material came from an understanding of chemistry. These different problems did not attract the interest of any one inventor, and although they might have been overcome by the co-operation of several, they seldom worked together at the time.

In 1925, John Logie Baird and C. Francis Jenkins independently constructed televisions based on the designs of the 1880's, and incorporated new modulating lights and photosensitive substances. But both models were crude and only capable of transmitting fuzzy silhouettes. Despite repeated efforts to refine their models, they failed because they did not receive sufficient financial support to experiment and rework their apparatuses. By 1927, the research divisions of large corporations achieved the most promising refinements because they had the resources to build and rebuild models, and were staffed with experts in a number of disciplines. Owing to its technical nature, individual inventors could not develop television but the corporate organizations that could build it clearly benefitted from their activities.⁴⁸

From 'Invention' to 'Research and Development'

The companies that were prominent in the development of television were formed to implement the ideas of inventors, such as Edison, Bell, and Marconi.

⁴⁸ Joseph H. Udelson, The Great Television Race: A History of the American Television Industry - 1925-1941 (Birmingham: University of Alabama Press, 1982) pp. 27-28.

Typically, these men designed technologies independently and hoped to profit from selling their patents or by attracting investments. Some did become rich, but their strategies were limited. As in the case of television, individuals were not able to experiment with technologies because they usually lacked resources and mechanical expertise. Consequently, successful and ambitious inventors established ‘invention factories’, where they stocked experimental equipment and staffed it with craftsmen. For example, Thomas Edison hired twenty artisans, including draughtsmen, to work at this Menlo Park laboratory.⁴⁹

Since invention factories made money primarily from selling patents to manufacturers, they needed to produce new technologies continually. Consequently, they could not undertake experiments that had no immediate prospects for patents. Moreover, improving patented technologies was often more profitable for manufacturers and they began to establish their own laboratories in the late 19th century. These manufacturers had the resources and the multidisciplinary research teams that were necessary to develop television. But unlike individual inventors, they were not innovative and instead, they worked towards expanding their existing commercial operations or on improving technologies that had a proven market.⁵⁰ Consequently, although companies alone had the means to further the development of television, they did not do so before 1925 because they did not associate the medium with existing systems. No such identification was made because there was

⁴⁹ Hughes, op. cit., pp. 25-40.

⁵⁰ Ibid., pp. 180-183.

no clear idea about how television might be used and because corporate managers gave little thought to the medium until a working model was available.

Early Ideas of Use

Since designs for televisions appeared immediately after the invention of the telephone in 1876, the medium was viewed as little more than an extension of the telephone. For example, in 1879, an English cartoonist, George du Maurier, portrayed a family watching a tennis match on a large screen and conversing with one of the players by telephone. In 1880, William Ayrton and John Perry, who designed two prototypes, stated that they had been led to the idea of television by du Maurier's sketch. A decade later, Perry predicted the wireless communication of sounds and sights, but solely for the telephone.⁵¹ Writing in Scientific American in 1911, Robert Grimshaw suggested that television be used to relay images from inaccessible or restricted places, e.g., to enforce industrial or military surveillance. Grimshaw did not anticipate that the technology had any entertainment functions and saw it strictly as a method of gleaning information for scientific, business, or military purposes.⁵²

John Logie Baird had "only the vaguest ideas of what a public [television] service meant, talking airily of transmitting photographs of speakers from London

⁵¹ Shiers, op. cit., p. 27.

⁵² Robert Grimshaw, 'The Telegraphic Eye', Scientific American, 104, 13, (April 1911) p. 151.

to Paris or installing television apparatus in theatres".⁵³ But this did not discourage him from forming a manufacturing company in 1925 and advertising 'televisors' for sale. Baird's neglect of the medium's use and concentration on overcoming technical problems was characteristic of individual inventors, including successful ones such as Alexander Graham Bell.⁵⁴ Nevertheless, interest in the technology grew quickly after Baird and Jenkins demonstrated their prototypes in 1925. Most of those who tried to improve the apparatus were individuals, some of whom were supported by small investors. But television also drew the interest of large electronics manufacturers who were seeking to augment their technologies with new features.

2. Corporate Development

The question of the uses of television came to the forefront within two years of the construction of prototypes. Since these early models could only transmit blurry silhouettes, the technology required refinement that had to make it suit a purpose. For example, a television designed for security surveillance would not necessarily require high definition and would be more effective at night if it detected infrared radiation. By contrast, a television used for broadcasting required high definition within the visible light spectrum. Many different uses were suggested between 1925

⁵³ Asa Briggs, The History of Broadcasting in the United Kingdom, Volume II, The Golden Age of Wireless (Oxford: Oxford University Press, 1965) p. 526.

⁵⁴ See Chapter 2, page 21.

and 1947, but only three were pursued by electronics manufacturers. Because television was developed to expand their existing technologies, other potential uses for which no technology had yet been widely applied, e.g. surveillance, were not pursued before the broadcast medium was domesticated.

The Video-Telephone

The first method proposed for the electrical transmission of moving images was to convey them along with telephone conversations. George du Maurier sketched a cartoon of this in 1879, and in 1881, the Electrician explicitly stated that the medium could be used in this fashion.⁵⁵ Moreover, when Bell declared in 1880 that he had designed a 'photophone', most assumed that he had discovered a way of augmenting his telephone system with images. In fact, Bell had devised a means of encoding sound in light in order to eliminate the need for wires, and not the video-telephone. Nevertheless, the designers of television were encouraged by what they believed was the famous inventor's interest in their field.⁵⁶

Shortly after Jenkins made the first American television, an engineer working for GE, Ernst Alexanderson, made a higher quality model. He envisioned its use as twofold: as a broadcast medium like the radio, and for amateurs to communicate

⁵⁵ Erik Barnouw, Tube of Plenty: The Evolution of American Television (New York: Oxford University Press, 1975) p.4.

⁵⁶ Shiers, op. cit., p. 27.

with each other. The latter was similar to both amateur radio and video-telephony.⁵⁷ The association of television with the telephone was strengthened after AT&T demonstrated its prototype in 1927. For the demonstration, the Secretary of Commerce, Herbert Hoover spoke into a telephone and was followed by several vaudeville acts, who also spoke or sang into a telephone. Most observers got the impression that AT&T was developing the new medium to improve and extend the telephone. For example, Mrs. Hoover stated that she did not "know whether this is a good invention or not. There are times when I talk over the phone and wouldn't want anyone to see how I look".⁵⁸

AT&T continued to experiment with the video-telephone throughout the 1930's. Despite successfully demonstrating a mechanical model in 1930 and an electronic model in 1934, AT&T did not believe that the technology could be profitable. In the 1930's, the German government built a video-telephone system in which special booths in different cities were linked with telephone wires. Anyone wanting to use it would contact a Labour Front office and pay a fee roughly twice the long-distance telephone rate. The Labour Front would arrange for the receiver of the call to be in his city's booth at the specified time, and thus, the callers could see each other while they spoke. No such system was started in the United States because AT&T officials believed that such an arrangement would be too expensive

⁵⁷ Waldemar Kaempffert, 'Science Now Promises Us Radio Sight Across Seas', The New York Times, December 26, 1926.

⁵⁸ 'Far Off Speakers Seen as Well as Heard Here in a Test of Television', The New York Times, April 8, 1927.

in the absence of subsidies.⁵⁹ Video-telephones did become available in the late 1980's, but are not yet domesticated.

Television Cinema

Throughout the late 1920's and early 1930's, television in movie theatres was widely considered to be the most promising use of the technology. Dr. Herbert Ives, who built AT&T's prototype, believed that television receivers would be too expensive for families and that it was more practical to place large sets in cinemas instead.⁶⁰ Television cinemas were promoted to convey sports events and 'super newsreels', or news programs. Although this type of theatre was never built in the United States, there were several attempts in Europe to form such networks. The first was built in Germany in 1936 to accommodate those who could not attend Olympic events, but was criticized because picture quality was too poor for the images to be recognizable.⁶¹ In 1939, an English experiment was a success; a boxing match was transmitted to three theatres equipped with televisions, and all three sold out. Plans to put receivers in a network of 350 theatres were drawn up, but the outbreak of war intervened and they were never implemented.⁶²

⁵⁹ 'Eye' Adds Sight to Phone Line', The New York Times, March 8, 1936.

⁶⁰ 'Says Costliness Sets Limit to Television', The New York Times, March 22, 1928.

⁶¹ 'Olympics in Television', The New York Times, August 6, 1936.

⁶² 'Notes on Television', The New York Times, March 12, 1939.

Predictions and hopes for television cinema continued throughout the 1940's. For example, David Sarnoff stated in 1947 that colour television would likely be employed first in theatres owing to its high cost, and RCA formed a partnership with Warner Brothers Pictures, which made movies and owned theatres.⁶³ The joint venture ended in 1948 because Warner Bros. was forced to sell its theatres and RCA realized that colour television would not be ready for many years. Underlying the failed promise of this use of television was the unwillingness of movie companies to invest in the new technology. Television offered them a chance to avoid making costly prints of their movies, but they simply were not interested in such an innovation. Despite television cinema's early promise, it became strictly a secondary use of the medium, usually confined to the transmission of boxing matches.

Domestic Broadcasting

The idea of using television for broadcasting to home receivers had even preceded the invention of the radio. David Sarnoff first proposed incorporating television into the radio industry in 1923, and after 1925 broadcasting was always mentioned as a possible use of the medium. In the mid-1930's, most public discussions changed from the general consideration of its technical nature and use to comments about the specific problems of a broadcast medium, e.g., frequency bandwidth and picture quality. But, there was no guarantee that it could ever be profitable because, like the video-telephone and television cinema, it had high

⁶³ T.R. Kennedy, Jr., 'All-Electronic Television Puts Color Images on Theatre Screen', The New York Times, July 14, 1947.

equipment costs and poor picture quality. Even as late as 1939, the manufacturers projected that only one household in eight would have a television.⁶⁴ Moreover, broadcast television had to be introduced on a wide scale from the outset and stations had to transmit programs before receivers could be sold and advertisers attracted. Consequently, the financial risk of introducing the broadcast medium was greater than with the other piecemeal uses. Despite these drawbacks, Fortune reported in 1939 that "outweighing the cautious logic of figures, which say that television cannot succeed on any conventional business basis, is an even stronger emotional conviction that it will succeed in some way".⁶⁵ Furthermore, radio companies were willing to invest to extend their operations with television, whereas telephone and motion picture companies were not, because they believed that this use of the medium was feasible and potentially profitable.

The radio companies, especially RCA, were willing to make these investments partly because they were consistently profitable. But more important, they did so because David Sarnoff firmly believed that like radio broadcasting, television would be lucrative. Although few shared his conviction, other companies invested in television fearing that they might otherwise be left out of a profitable business. Consequently, the decisions to make television a broadcast medium were made according to business criteria, i.e., forecasts of returns on investments, and not on

⁶⁴ 'The Promise of Television', Fortune, XXVIII, 2, (August 1943), p. 202.

⁶⁵ 'Television II: Fade In Camera One' Fortune, XIX, 5, (May 1939), p. 164.

wider social considerations. At the same time, industry spokesmen tried to justify their actions and prepare a market for receivers by stressing the potentially benign effects of the medium. This vision, first articulated by Sarnoff and accepted by all those commenting on television during its infancy, had four elements.

Three were directly related to characteristics of the medium: the speed with which it could disseminate visual information, the ease with which its messages could be understood, and where the messages were received. The fourth was the linking of television with broader technological developments. For example, when the domestication of television appeared to face insurmountable difficulties, Fortune reported that "the country's drive towards scientific advancement and a higher standard of living is so strong and so wide that it is impossible to conceive, either emotionally or historically, that television can be neglected or left undeveloped".⁶⁶ In other words, television had to be developed because it was part of a wider set of beneficial technologies.

Physical Accessibility and the Extension of Sight

For the most part, the expected benefits of television were linked to those characteristics that made broadcast television a unique medium. The most frequently mentioned advantage was that television would allow its audience to witness events

⁶⁶Ibid, p. 164.

it would not otherwise be able to see. For example, David Sarnoff predicted that:

The whole country will join in every national procession. The backwoodsman will be able to follow the play of expression on the face of a leading artist. Mothers will attend child-welfare classes in their own homes. Workers may go to night school in the same way.⁶⁷

While radio performers were often mentioned as stars of future television programs, television's ability to make 'cultural' events accessible to all was also emphasized. Not only would the theatre, the ballet, the opera, and higher education become available outside cities, but to urban areas as well. To these commentators, the home had become a more convenient and superior place for witnessing what had previously only been available in public. They identified distance and travel as the limits on what people could experience and enjoy. Consequently, they looked upon television as a liberating technology.⁶⁸

The attractiveness of bringing information and entertainment into the home also affected the development of the facsimile machine. This device was invented

⁶⁷ Udelson, op. cit., p. 47.

⁶⁸ Some of the first discussions of the above were: Waldemar Kaempffert, 'Science Now Promises Us Radio Sight Across Seas', The New York Times, December 26, 1926; 'London Scientist Sees New World in 20 Years, With Television and No Drudgery in Home', The New York Times, March 1, 1927; David Sarnoff, 'Forging an Electric Eye to Scan the World', The New York Times, November 18, 1928; 'American Eavesdrops as Marconi Broadcasts', The New York Times, May 4, 1930; Lee de Forest, 'De Forest Look Ahead', The New York Times, July 27, 1930; and Dr. Alfred Goldsmith, 'Radio's Second Decade Begins', The New York Times, November 2, 1930. There were many more examples of this discussion after 1930.

in 1921 by RCA engineers, and until the 1980's, it was used mostly to transmit photographs for newspapers. But in the 1920's and 1930's, RCA tried to sell them as a domestic information medium with families having a newspaper transmitted and printed in their homes.⁶⁹ Facsimile broadcasting failed and the proposed use blinded RCA to other possibilities, such as instant mailing or photocopying.

Not only could television bring public events into the home, it could do so instantly, which eminently suited it for transmitting news and sports. Television would "extend the range of the eye to the four corners of the world".⁷⁰ The medium was discussed as if it were an extension of the eye and that the audience would look through it as through a telescope or eyeglasses. This characteristic was thought to make television superior to motion pictures, where the audience could see only what had happened in the past.⁷¹

Intelligible Messages

Since television could present the sights and sounds of events, it was believed capable of presenting its messages in a more understandable form than other media. It would allow its audience to "see the world, to witness events, to understand the

⁶⁹ 'Sarnoff Predicts Television in 1940', The New York Times, December 8, 1935; 'Radio Spans Oceans to Hail M.I.T. Here', The New York Times, June 12, 1927.

⁷⁰ 'Forging an Electric Eye to Scan the World', The New York Times, November 18, 1928.

⁷¹ Udelson, op. cit., p.47; 'Sarnoff Belittles Well's Radio Ideas', The New York Times, April 29, 1928; 'Forecasts Big Future for World Television', The New York Times, February 14, 1930; 'Hopes of the Future', The New York Times, November 15, 1936.

movement of history".⁷² In 1932 the Bishop of Washington was "of the opinion that by making religion more articulate, the new invention 'must give freshened demonstration of the value of that which the church stands for'".⁷³ The Bishop went on to say that by allowing people to experience other cultures, the medium would promote tolerance and world peace.⁷⁴ Television would not only make news comprehensible, but would also improve other types of education. For example, it was predicted that the medium would be valuable for adult education, teaching consumers about new technologies, and ultimately replace conventional methods of education and socialization.⁷⁵ In this case, television was promoted not to transmit unique programs, but to communicate information in a more intelligible form. Consequently, the Bishop of Washington looked to the medium to make religion more accessible and Dr. Pupin thought it would make people understand and like

⁷² 'The Promise of Television', Fortune, XXVIII, 2, (August 1943) p.204.

⁷³ 'Paints New World in Television Era', The New York Times, June 20, 1932.

⁷⁴ This argument was repeated throughout the 1930's. For example, Professor Michael Pupin of Columbia University believed that with television, every man "will be a neighbour to every other and will know that every other deserves to be loved. That is the best indication that humanity will be saved and that it is not going to destruction". 'Pupin Predicts Far Vision', The New York Times, May 5, 1932.

⁷⁵ 'Radio Moving Pictures of National Wonders Predicted', The New York Times, April 27, 1924; David Sarnoff 'Sarnoff Discloses Plan for Nation-Wide Television', The New York Times, May 31, 1931; 'Paints New World in Television Era', The New York Times, June 20, 1932; 'Schools Here Plan New Television Use', The New York Times, June 19, 1936; 'Television is Used for NYU Lecture', The New York Times, May 20, 1938; and 'Notes on Television', The New York Times, March 26, 1939.

one another. They asserted that an audience would learn more about something by witnessing its sights and sounds than it would from a second-hand description, either orally or in print.

The high expectations of the corporate managers and technological enthusiasts regarding television were not unique. The same themes of providing greater options of what one could choose to witness and greater understanding and control of one's surroundings also appeared in promotions of the telephone. As Carolyn Marvin notes in When Old Technologies Were New, the first subscribers to a telephone service considered the medium to be a means of expanding their friendship circles. Thus, compatible people could now interact easily over any distance and, equally important, allow one to control and screen social contacts. One result was that elites, who were the first subscribers, resisted the telephone companies' attempts to lower the cost of the service and introduce pay phones. They believed that their autonomy and control over others would be weakened if anyone could telephone them.⁷⁶

Like the television, the telephone was promoted to create a 'community without propinquity' and to 'annihilate distance'. Both media promised to provide users with suitable options tailored to their desires. The unquestioned assumption, as Marvin points out, was that, "central to all the good things that new technologies of communication would accomplish was the building of a better, usually construed

⁷⁶ Carolyn Marvin, When old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century (New York: Oxford University Press, 1988) pp. 102-107.

to mean more open and democratically accessible, communities.⁷⁷ But this view ignores the fact that electronic media shape social life in many indirect and unexpected ways, and, as Marvin correctly argues, that the telephone was welcomed for the freedom that it offered, but not all its effects were desired. In her words, "new forms of communication put communities like the family under stress by making contact between its members and outsiders difficult to supervise."⁷⁸ One sign was the proliferation of jokes about a daughter circumventing her father's choice of a spouse by using a telephone for conversations with inappropriate suitors. In Talking Tombstone & Other Tales of the Media Age, Gary Gumpert also challenges the unqualified liberating effect of electronic media in the sense that they free individuals "from involuntary membership in the non-voluntary community".⁷⁹ Gumpert asserts that this freedom has not been satisfying because although electronic media have allowed individuals to witness or interact with those far away, they tend to separate them from those who are nearby.

The success of the electronics manufacturers to frame television as a liberating force is evident in nearly all discussions of the medium during its development. They managed to give the impression that it was simply a means for giving individuals greater access to information and entertainment, and nothing more. Consequently, the manufacturers were allowed to construct the medium in the

⁷⁷ Ibid, p. 65.

⁷⁸ Ibid, p. 69.

⁷⁹ Gary Gumpert, Talking Tombstones & Other Tales of the Media Age (New York: Oxford University Press, 1987) p. 177.

form they expected to be most profitable without consideration of its effects. Enthusiasm about the promise of the medium overwhelmed any thought of the latent consequences of this powerful technology. And it is at this point that we need to consider the role of government in broadcasting.

Government Influence on Broadcasting

IV

Even after television had been identified with radio broadcasting, many of the medium's design features had yet to be established. Since television was to use radio waves, which were public property, the American government influenced its development and thus politics became implicated in the technology and deployment of television. Specifically, government actions were responsible for determining who would broadcast, for what purpose, and some design features of the apparatus itself. These policies, in turn, were influenced by ideas about the roles of government, business, and other private groups in the management of technologies. Some

legislation, such as tariff, tax, and patent laws, were crucial to the entire development of the technology but will not concern us in what follows. Instead, this chapter will consider only those policies directly related to broadcasting and television.

I. Manufacturers and Networks

In contrast to the British Post Office which began regulating radio in 1904, the American government hesitated to intervene until 1912 when the navy insisted that it exercise control over radio. The navy wanted Congress to pass a law giving it exclusive use of channels so that it could communicate with ocean-going ships. Neither the navy nor Congress wanted to extend control over radio beyond ensuring that naval communications would not be obstructed.

Congress had a number of options that would have satisfied the navy, including the prohibition of amateur transmissions altogether, but chose a relatively weak solution. Although the Secretary of Commerce was empowered to license all transmitters and assign each a time and frequency, he could not deny a transmitting license to any qualified individual. At the time, there was no need to restrict the number of transmitters because the spectrum still contained many unused frequencies. But Congress was shortsighted in not realizing that the numbers would increase with technical improvements. Instead of taking precautions against problems arising from new uses of the technology, Congress adopted an ad hoc measure that

involved the least government control. Consequently, the Radio Act could not maintain order when stronger action was needed.⁸⁰

The policy established by the Act was that radio waves were a public resource whose use by any citizen for any purpose would only be restricted if it interfered with other transmissions. Any application of this new and unpredictable technology was presumed to be beneficial or benign, and the Act was designed to allow for its orderly use. Nevertheless, the law failed to stop interference because many of the amateurs simply ignored it and the Commerce Department did not make a serious effort to enforce its regulations. But the failure of the Act was not due solely to noncompliance. The most immediate crux of radio was manufacturing, not transmitting.

Before the First World War, radio technology changed rapidly because it attracted a great deal of interest. For example, professional engineers and tinkerers experimented with modifications and found some useful and patentable features. These patents were valuable because owning them allowed electronics manufacturers to improve their products and collect license fees from others. Since assigning patents entails the distinction between improvements and innovations⁸¹, it was not always clear who held what patents and who should be paid license fees for what.

⁸⁰ George Gibson, Public Broadcasting: The Role of the Federal Government, 1912-76 (New York: Praeger Publishers, 1977) pp. 4-5: and Erik Barnouw, A Tower of Babel: A History of Broadcasting in the United States, Volume I - to 1933 (New York: Oxford University Press, 1966) p.121.

⁸¹ Patents may be granted for innovations, but not improvements.

Along with genuine confusion, radio companies violated or challenged the legality of each other's patents and denied others the use of their own in order to monopolize manufacturing.⁸²

The Radio Corporation of America

The ensuing tangle of patent litigation complicated the production and compromised the quality of radios. To facilitate production after the U.S. entered the war, private patent rights were suspended. But, both the military and the manufacturers wanted a permanent solution and all favoured some sort of monopoly. As a result, the army, the navy, and the manufacturers compromised and RCA was formed in 1919, and controlled all radio manufacturing, transmitting, and American patent rights. Although RCA was a monopoly controlled by radio manufacturers, the military was not troubled by the arrangement because it was free to buy equipment from the competing member manufacturers. At the time, the formation of RCA seemed ideal; the patent and interference difficulties were overcome without long-term government intervention. Moreover, the control of radio technology could be turned over to a private company without compromising the government's interest in it, which was defined solely as supplying the military. The radio industry might have been organized satisfactorily once and for all had broadcasting not appeared.

⁸² Barnouw, op. cit., p. 47; and Laurence Bergreen, Look Now, Pay Later: The Rise of Network Broadcasting (Garden City, NY: Doubleday & Company, 1980) pp. 33-35.

The Arrival of Broadcasting

By the time RCA had organized itself, broadcasting began its boom. To many, its arrival in 1920 was not unexpected because amateurs had been transmitting news and music, albeit irregularly, for nearly a decade. The change from amateur to professional broadcasting surprised the creators of RCA who had looked upon amateur activities as a nuisance to maritime communications. They failed to see the possibility for any other use for radio and that RCA would contribute to the problems of radio broadcasting. After 1920, RCA was no longer the sole private transmitter because too many others wished to broadcast and there were no legal grounds to deny them licenses under the 1912 Radio Act. Furthermore, the increased market for equipment that was the result of new stations and listeners made radio manufacturing potentially profitable and thus attractive to other manufacturers. As a result of all this, RCA could not control broadcasting and manufacturing the way it monopolized maritime radio. But it was, owing to its size and patent pool, by far the most important radio company. Others had to buy RCA equipment or pay license fees, which limited their profits and added to those of RCA.

Complaints to the Federal Trade Commission, which was partially responsible for enforcing anti-trust laws, against RCA began in 1923. Many of the early objections centred on AT&T's exclusive right to manufacture transmitters under the RCA agreement. AT&T refused to supply others until it had furnished all RCA stations, and thus, others could not legally buy or build their own transmitter. The FTC was slow to act on the complaints and by the time it began investigating, AT&T

had left the RCA group. The investigation ended when the telephone company announced that it would no longer operate stations and show no preference when it sold equipment.

The withdrawal of AT&T did nothing to reduce RCA's dominance of receiver sales or weaken its patent pool, and the growth of its networks extended its role in broadcasting. Nevertheless, the FTC stopped investigating RCA. Throughout the 1920's, the FTC did not see the increasing size of businesses as undesirable and, in the words of Commission Chairman William Humphrey, the agency should not be "an instrument of oppression and disturbance", but instead would help business.⁸³ In other words, there was nothing wrong with having a company like RCA controlling an industry and technology. Although the FTC took no action to increase competitiveness, the Radio Act of 1927 did state that if broadcasters were convicted of violating an anti-trust law, they would lose their transmitting licenses. But the Act did not define what a monopolistic practice in broadcasting might be.

Broadcast Monopolies

A few competitors, most notably Philco and Zenith, grew rapidly in the 1920's and by the end of the decade were selling more receivers than RCA. But the latter refused to license other manufacturers to make vacuum tubes and retained its monopoly in this area. Consequently, all radio production depended on RCA's delivery of tubes, which gave it considerable leverage with its competitors. These

⁸³ Barnouw, op. cit., p.203.

competitors appealed to President Hoover and in 1930, he ordered the Justice Department to investigate. Later in the same year, RCA was convicted of violating anti-trust laws and was forced to license others to manufacture tubes and sever its ties with GE and Westinghouse. Although RCA remained the most powerful radio company because it retained its patents, networks, factories, and research facilities, other manufacturers were given better opportunities to prosper. Under the Radio Act, RCA should have lost its transmitting licenses because it had broken an anti-trust law. Nevertheless, the FRC voted to reissue the licenses because the violation pertained to manufacturing, not broadcasting, though the Act made no such distinction.⁸⁴

The government's concern with monopolies increased after the election of Franklin D. Roosevelt in 1932. The President, or at least some of his advisors, believed that the depression had been exacerbated by the unhindered operation of private businesses, and that business activities would have to be augmented and limited by government programs. Consequently, anti-trust laws had to be enforced to ensure that no one company exercised too much control over any industry. But the radio industry was not given priority, and the FCC did not begin to investigate broadcast monopolies until 1938. In 1941, the agency addressed the question that had been raised by the 1927 law: what constituted a monopoly in broadcasting? To limit monopolies, the FCC ruled that affiliates could not be forced to broadcast any

⁸⁴ Ibid, pp. 252-257; and E. Pendleton Herring, 'Politics and Radio Regulation', Harvard Business Review, 13, 2, (January 1935), p. 176.

network program that they did not want to transmit, no company could own more than one network, licenses were limited to one per company per market, no person or company could own more than six stations, and the owner of the sole newspaper in a market could not own the only radio station.⁸⁵

Most of these proscriptions were cautionary or contingent, e.g., one person was allowed to own a maximum of six stations because that was the most that anyone had at the time.⁸⁶ The only actual changes effected by the ruling were those involving the networks. CBS was forced to change its agreement with its affiliates and NBC had to sell one of its networks. Predictably, they opposed the ruling and since the FCC would not voluntarily back down, they lobbied Congress to force the agency to change it. The networks could muster support and discourage opposition among congressmen by monetary contributions to their election campaigns and providing radio air time. In this case, a few congressmen actively took up the network's cause and the rest tacitly supported them.⁸⁷

But congressmen could not publicly support the networks because appearing 'pro-monopoly' was not politically prudent. Instead, they attacked the FCC for its autocratic use of authority, and a congressional committee was formed under

⁸⁵ Erik Barnouw, The Golden Web: A History of Broadcasting in the United States, Volume II - 1933 - 1953 (New York: Oxford University Press, 1968) pp. 130-133.

⁸⁶ The stipulation was later lifted for radio stations, which has allowed companies like General Tire and Rubber to own as many as seventeen stations. Now, no company may own more than seven television stations (5 VHF, 2 UHF). James Monaco, Media Culture (New York: Delta, 1978) p.293.

⁸⁷ Barnouw, The Golden Web, op. cit., pp. 173-175.

Representative Eugene Cox to investigate the Commission. The committee first asked the FCC chairman, J.L. Fly, to change the ruling. When he refused, it stopped paying two members of the agency's staff and introduced an amendment to withhold its budget. Without a budget, the Commission would have effectively been abolished and, as one representative wrote, "all the confident forces of conservatism and reaction were arrayed behind the amendment" and "those forces constituted an unquestioned majority in the House".⁸⁸ Fly tried to challenge the legitimacy of the committee by sending evidence of a payment to Rep. Cox from a radio station to the Speaker of the House and the Justice Department. Although the payment was blatantly illegal, neither the Speaker nor the Justice Department showed any interest in prosecuting Cox.⁸⁹

But the FCC was saved by the intervention of an energetic and imaginative Congressman, Lyndon B. Johnson from Texas. Not long before the beginning of the investigation in January 1943, Johnson was preoccupied with financial insecurity, because his considerable income would be lost if he was not re-elected. Clifford Durr, an FCC commissioner, and other friends told him of the profitability of commercial radio stations. Johnson soon arranged to buy, in his wife's name, a small and unprofitable station (KTBC) in Austin, Texas, pending approval by the FCC of the sale. Despite having rejected several other applications to buy the station in the

⁸⁸ Robert A. Caro, 'The Johnson Years: Buying and Selling', The New Yorker, LXV, 44, (December 18, 1989), p.54.

⁸⁹ Barnouw, The Golden Web, op. cit., pp. 175-176; and Caro, p.54.

previous few years, the FCC hastily allowed KTBC to be sold to Johnson's wife in mid-February, 1943.

Meanwhile, Johnson kept the agency informed of the plans of the investigating committee, and he tried to convince the powerful Speaker of the House, Sam Rayburn, to stop the investigation. Initially, the Speaker had closed ranks behind Cox on the bribery charges. But after Johnson spoke with him, he withdrew his support for Cox. Although Johnson was not politically powerful, Rayburn had a paternal affection for him, which along with the publicity about Cox's bribe, convinced him to force Cox to resign from the investigating committee in mid-February. By June, KTBC Austin, had been moved to a more desirable frequency and its transmitting hours were extended by the agency. Although CBS had recently rejected the applications of several Austin stations to become affiliates, KTBC became a CBS affiliate after Johnson paid William Paley a visit. His station became even more profitable after the war when the agency allowed it to increase its transmitting power fivefold. Meanwhile, the investigation of the FCC had ended in July 1943, and the agency had its budget cut by only one quarter.⁹⁰

The Effectiveness of the Anti-trust Rulings

Although the ruling stood and the networks suffered, this anti-trust case did not make much difference in shaping the broadcasting industry. NBC did have to sell one of its networks, which became ABC, but the other rulings had little effect. For

⁹⁰ Caro, op. cit., pp. 54-62.

example, a network could not force its affiliates to broadcast its programs, but for the most part stations willingly accepted them. Stations found that broadcasting network offerings was more profitable than making their own or using syndicated programs,⁹¹ especially with the high cost of producing television programs. Consequently, affiliated stations only rarely reject network programs and the control of the networks over broadcasting was not weakened by the 1941 ruling. The other stipulations designed to break up regional media monopolies were never enforced.

The political power of the networks was partly responsible for the concentration of television broadcasting after the 1941 ruling. Chairman Fly and the other members of the Commission were only saved from impeachment by Cox's indiscretion and Johnson's acquisitiveness. The power of the networks and the cost of Congressional support made the agency reluctant to confront the industry directly. The feebleness of the attempts to diffuse control over broadcasting stands in sharp contrast to the successful weakening of RCA's dominance over manufacturing in 1930. In the latter case, rival manufacturers were able to identify which of RCA's practices harmed them, and lobby for appropriate changes by the executive and legislative branches. But with regard to the 1941 ruling, the FCC did not have any corporate allies whose lobbying would counteract that of the networks. Furthermore, the Commission did not have a clear idea of how it wanted the broadcasting industry organized. It merely tried to weaken NBC and CBS, and not implement any other

⁹¹ A syndicated program is one that the station buys directly from the studio that produced it. Unlike a network program, the station sells the advertising time. Syndicated programs are usually older movies or reruns of network programs.

alternative, such as strictly regional networks or prohibiting them altogether. Without an explicit goal, the agency was not able to justify the changes effected by the ruling or convince others of their necessity.

Throughout the 1940's, the FCC had the opportunity to put television broadcasting under a form of organization different from radio. But the same commissioners who pushed through the 1941 ruling granted FM and television licenses to the networks and their affiliates. The two criteria that the Commission used to award a television license were technical expertise and the financial ability to sustain years of transmitting before earning a profit. Both favoured radio network affiliates because they had experience broadcasting, access to network expertise in television, and relatively large amounts of money. Consequently, 77% of television station licenses were held by radio station owners in 1950. Moreover, the network affiliations of radio station owners were usually extended to television.⁹²

Television broadcasting became more concentrated than radio because there could be relatively few stations. Furthermore, the frequencies allocated to television were split into two blocks with a few channels in the VHF range, and the bulk in the UHF range. In the 1940's, the UHF frequencies were unusable thereby limiting the number of possible national networks to three.⁹³ Although the FCC split the television allocation with the support of most manufacturers and broadcasters

⁹² Robert H. Stern, The Federal Communications Commission and Television: The Regulatory Process in an Environment of Rapid Technical Innovation (New York: Arno Press, 1979) p. 324.

⁹³ Not all channels could be used in all areas because stations interfered with each other on the same and adjacent channels.

because VHF transmitting equipment had been developed, there was not enough space in the VHF range to accommodate the entire allocation. Thus the domestication of television would have been delayed had it waited for UHF transmitting. On the other hand, UHF broadcasting would not have been dominated by three networks. Several others, specifically DuMont and Mutual, tried to establish networks but failed because they could not gather enough affiliates to provide national exposure for their sponsors.⁹⁴

Both the criteria for granting licenses and the splitting of the television allocation, speeded the domestication of the technology. But by doing so, the FCC relinquished control of television broadcasting to the three largest radio networks - the same organizations it fought so bitterly to weaken a year or two before. Simply put, the FCC failed to change the broadcasting industry in the 1940's because it was dedicated to the rapid deployment of a technology regardless of who controlled it. The questions of monopoly and control were secondary, and became salient only after the technology had become domesticated.

2. Advertising and Broadcasting

Opportunities to promote diverse control of television broadcasting or to achieve any other public goal were not limited to anti-trust enforcement. With its

⁹⁴ Muriel Cantor and Joel Cantor, 'United States: A System of Minimal Regulation', in The Politics of Broadcasting, ed. Raymond Kuhn (New York: St. Martins Press, 1985) pp. 165-166.

authority over stations, the government was also partly responsible for the pre-eminence of the three commercial networks. Nevertheless, it was also instrumental in the establishment of the non-profit Public Broadcasting System. Both types of networks grew out of the commercialization of broadcasting and the reaction against it. Consequently, each had its origins in the early 1920's when radio stations were facing the problem of paying for broadcasting. Broadcasting was first undertaken by radio manufacturers to encourage the sale of receivers. They were willing to pay for it because no one would buy their receivers unless something was broadcasted. At the same time, they wanted broadcasting to be self-supporting once a demand for receivers had been created.⁹⁵

Paying for Broadcasts

Four plans were suggested to pay for broadcasting between 1921 and 1925. One was that states and municipalities pay for broadcasting with tax revenues, as they paid for schools, museums, and art galleries. But few cities had the initiative, financial resources, or expertise in the early 1920's to establish stations over the opposition of some businesses. For example, AT&T, which had a monopoly on the manufacture of transmitters at the time, refused to sell one to New York City and, instead, offered to sell the city time on its station. City officials refused and imported an AT&T manufactured transmitter from Brazil.⁹⁶ Nevertheless, few other cities

⁹⁵ Barnouw, op. cit., A Tower of Babel, p. 70, 105.

⁹⁶ Ibid., p. 109.

had New York's persistence or resources. Some public universities did establish stations hoping that radio would become another means of education.

A second suggestion was for philanthropists to establish and endow stations but none, in fact, did. Another was that a common fund controlled by an elected board be established through donations. Early attempts to solicit donations were not successful. For example, AT&T's New York station, WEAF, invited contributions to pay performers on unsponsored programs. The attempt was abandoned, however, after collecting \$1000, which was far too little. A fourth proposal was put forth in 1922 by the General Manager of RCA, David Sarnoff, who urged that an independent, national broadcasting organization be formed. This organization would have been financed by a tax on the sale of radio equipment, and controlled by a board representing the industry and public.⁹⁷ Of these four proposals, only that of government financing and Sarnoff's plan were practicable in the 1920's because Americans did not seem willing to pay for broadcasting.

Given the strong resistance to advertising as a source of financing broadcasting during this period, it is surprising that it ultimately became the primary means of achieving this goal in the United States. The most respected trade magazines, Radio Dealer and Radio Broadcast condemned commercial broadcasting, and in July 1922, Printer's Ink called it "positively offensive to great numbers of people".⁹⁸ At the Washington Radio Conference, Herbert Hoover, the Secretary of

⁹⁷ Ibid, pp. 155-157.

⁹⁸ Ibid, pp. 107-108.

Commerce, said "it is inconceivable that we should allow so great a possibility for service be drowned in advertising chatter".⁹⁹

Despite complaints from most of those in the radio industry, AT&T's commercial network gained sponsors and added affiliates. None of the other methods of financing broadcasting were attempted, and in 1924, RCA started another network. Although he publicly opposed it, Hoover could not ban advertising because he had no legal control over program content. Nor did he attempt to curb advertising when an opportunity arose, e.g., when the 1927 Radio Act was being drafted. To the contrary, Hoover actually made more time available to advertisers by granting WEAF and other commercial stations clear channels in 1923. With a clear channel, WEAF no longer had to share a frequency with any other station.¹⁰⁰

Voluntary Cooperation in Industry

Despite criticizing advertising, Hoover encouraged those broadcasting advertisements and did nothing to limit what could be transmitted. This inconsistency stemmed from his views about the proper role of government. He believed that government attempts to force private businesses to conform to national policies would not only lead to economic inefficiency but to a totalitarian state. At the same time, Hoover did not think that unrestrained competitive capitalism operated efficiently either. Instead, businesses operated best when the government organized

⁹⁹ Ibid, p. 108.

¹⁰⁰ Ibid, p. 177.

voluntary cooperation among all interested parties, encouraged them to take a 'national conception' of what should be done, and supplemented their actions with informational aids and government support. In this view, voluntary cooperation would be implemented by communication channels, specifically newsletters and industrial conferences, sponsored by the Commerce Department. In other words, businesses could be persuaded and encouraged to act in the public interest while pursuing profits.¹⁰¹

The Unemployment Conference of 1921 was an example of how this strategy was supposed to work. Unemployment rates were high following the war, and attempts by Wilson's administration to solve the problem were ineffective. When Hoover became Secretary of Commerce in 1921 following the election of Warren Harding, he set about organizing a conference of delegates from local governments, companies, business associations, and labour unions. At the outset, Hoover told the conference that only local and voluntary action, not federal intervention, could solve the crisis. The delegates then formed committees to discuss specific topics and within three weeks reconvened. They recommended that all public works and private investments scheduled for the near future be immediately undertaken. The Commerce Department publicized the recommendations and coordinated local public works. Since unemployment decreased over the next year, Hoover's strategy appears

¹⁰¹ Robert K. Murray, 'Herbert Hoover and the Harding Cabinet', in Herbert Hoover as Secretary of Commerce: Studies in New Era Thought and Practice, ed. Ellis W. Hawley (Iowa City: University of Iowa Press, 1981) pp. 25-26; and Ellis W. Hawley, 'Economic Stabilization, 1921-22', Ibid., pp. 46-49.

to have been successful.¹⁰²

The strategy of encouraging cooperation without coercion could not induce businesses to do what they otherwise would not, and thus failed to alleviate radio interference and stop advertising. Hoover convened four Radio Conferences, and while each condemned interference and advertising, both continued. Much of the former resulted from the shortage of frequencies available for broadcasting. Consequently, stations had to share frequencies and could only broadcast for part of the day. Some stations, often when rival newspapers were their owners, intentionally interfered with each other's broadcasts. But more commonly, stations broadcasted slightly above or below their assigned frequencies which interfered with other types of radio transmissions. Despite its unanimous condemnation by the industry, intentional interference persisted because it was in the interests of individual stations.¹⁰³

Hoover's strategy also doomed the only non-commercial possibilities for funding broadcasting. He resisted federal and local government financing because he believed that a government should only serve to coordinate private actions. Sarnoff's suggestion of an independent organization paid for by a tax on radio equipment did not seem to require government intervention. In practice, however, the establishment of such an organization would have required determined

¹⁰² Hoover later claimed that the conference restored five million workers to employment. Ibid., pp. 25-26.

¹⁰³ Gibson, op. cit., pp. 4-5; and Barnouw, A Tower of Babel, op. cit., p. 179.

government action, as the following discussion of the British Broadcasting Corporation clearly illustrates.

The Origins of the BBC

The Marconi Company first broadcasted in Britain in 1920 but complaints from the military forced them to stop shortly after. Nevertheless, pressure from the public for regular broadcasting grew as Britons became aware of foreign broadcasts. The Post Office, which was the licensing authority, partly relented and allowed radio manufacturers to broadcast without advertising. Before it could begin, however, Post Office officials insisted that the radio manufacturers organize themselves into one or two broadcasting companies. The manufacturers, some of them subsidiaries of American companies, disagreed on issues like patent fees, who would build the transmitters, who would be included in the company, how it would be financed, and how it would be operated. The meetings broke down several times because the manufacturers would not compromise. Since the P.O. would not arbitrate and the manufacturers had no market for receivers until a broadcasting company was formed, the latter had no choice but to settle their differences.¹⁰⁴

In 1923, the manufacturers formed the British Broadcasting Company, which was financed by a tax on the sale of radio equipment and a license fee levied on receivers. Since they had no opportunity to profit from broadcasting, the members

¹⁰⁴ Asa Briggs, The History of Broadcasting in the United Kingdom, Volume 1, The Birth of Broadcasting (London: Oxford University Press, 1961) pp. 93-127.

of the BBC quickly lost interest in the company once a market for receivers had been created. In 1926, the Company became a publicly owned corporation that was financed solely by license fees. Later that year, the managers of the BBC asked the Post Office to allow it to raise money through advertising. The latter refused to change its earlier decision, insisting that radio waves be treated as a public trust and not for private gain. This meant that no organization or individual had a 'right' to use radio, as was legally the case in the United States. Moreover, the politicians who controlled the P.O. were firm and patient enough to wait for the manufacturers to agree on a non-commercial scheme. In other words, they were willing to delay the employment of the technology until its management and use was acceptable to them.¹⁰⁵

By contrast, Hoover's unwillingness to impose a funding scheme or force the industry to agree on one doomed Sarnoff's proposal, which was similar to the original BBC arrangement. AT&T, and others, believed that advertising supported broadcasting was in their best interests and they vetoed any non-commercial scheme by refusing to cooperate. In the absence of rules governing program content, stations increasingly sold advertising time because it was the only practical way of offsetting their costs that did not require government involvement. Stations joined networks in order to further reduce the cost of programs. Although commercial broadcasting

¹⁰⁵ Ibid, pp. 340-351; and Maurice Gorham, Broadcasting and Television Since 1900 (London: Andrew Dakers Limited, 1952) p. 26.

was not considered ideal,¹⁰⁶ in time, the public, the industry, and Hoover became accustomed to advertising and it ceased to be objectionable.

1927 Radio Act

By 1925, Hoover had to retreat from his strategy of voluntary cooperation because some stations simply would not stay within their allotted hours and frequencies. He punished the offenders by temporarily closing down their stations. For example, Aimee Semple McPherson, a Californian evangelist, had her station closed in 1925 for consistently interfering with other transmissions.¹⁰⁷ The step to direct regulation was followed by the decision, at the behest of broadcasters, to cease issuing new transmitter licenses. This, in turn, forced the government to reformulate its regulatory policies. Before 1925, radio waves were public property that could be used to transmit or receive by anyone for any purpose. Although they remained public property after 1925, public use was limited to receiving and the government was to decide who should broadcast. One might have expected Hoover to consider one type of broadcast more desirable than another, but no such explicit policy was promulgated.

The beginning of forceful regulation by Hoover exceeded his legal authority to do so. Consequently, all his rulings were struck down in court and radio stations

¹⁰⁶ This was the case partly because radio broadcasting did not become consistently profitable for stations and networks until the late 1930's.

¹⁰⁷ Barnouw, A Tower in Babel, op. cit., pp. 179-180.

broadcasted whenever and at whatever strength they chose. Needless to say, this resulted in chaotic interference. Audiences and broadcasters agreed that interference made most transmissions unintelligible and a new law was necessary to carry out the type of regulation Hoover sought. Just as they had urged Hoover to regulate them in the first place, established broadcasters encouraged Congress to legalize this regulation. The broadcasters would have preferred to keep radio regulation within the Commerce Department because they trusted Hoover. But since it would raise his public standing, some powerful senators did not want Hoover to be able to take credit for sorting out the confusion in broadcasting. Hoover's presidential ambitions were well known, and his rivals and enemies in the Senate did not want him to gain prestige from the radio law. Consequently, the Senate insisted that radio be regulated by a commission independent of the Commerce Department.¹⁰⁸

The 1927 Radio Act accomplished what the larger broadcasters hoped that it would: it provided the legal basis to limit the number of transmitters without banning advertising. Limiting the number of transmitters still posed a threat to all license holders because some stations had to be closed down. Although the FRC was expected to limit the number of licenses, the Act did not provide it with clear directions of how to do so. The only guidance was that the FRC was to rule according to the 'public interest, convenience, or necessity'. Commercial broadcasters lobbied the Radio Commission to maintain all existing broadcasting practices and to reduce the number of stations. On the other hand, educational broadcasters

¹⁰⁸ Herring, op. cit., p. 168.

interpreted 'public interest' to mean that they should be favoured over those whose goal was simply to earn a profit.¹⁰⁹

Faced with the contradictory pressures to maintain the commercial status quo and to use radio for adult education, the FRC did not publicly ally itself with either interest. The agency refused to recognize a difference between profit and non-profit broadcasting because it would, commissioners argued, constitute censorship. But it could not explicitly favour commercial broadcasters either. Instead, the FRC ruled that it was in no position to judge programs and that since clear reception was paramount, it would judge a station according to the quality of its transmitter. Far from being neutral, this criterion favoured large stations and network affiliates over small and non-profit stations since the former could afford the best transmitters.

The FRC's promotion of technical standards was not simply veiled support for commercial radio. Although commercial broadcasters agreed with the criterion, it harmed them in the case of mechanical television. The Commission asked the Radio Manufacturers Association in 1928 to agree on standards for television. The RMA complied but the agency rejected the proposed standards and refused to authorize commercial television until the picture quality was greatly improved. Mechanical television was effectively doomed because it would never be able to meet the FRC's expectations, and investments by radio companies, such as AT&T, CBS, and Don Lee Systems, were lost.

Although the FRC claimed that it could not limit the content of broadcasts,

¹⁰⁹ Cantor and Cantor, op. cit., p. 170.

some programs were considered offensive and were prohibited. For example, stations could not broadcast for 'selfish' purposes, which was defined as propagandizing, and two rules were implemented to minimize this practice. The first, the 'equal time clause', required a station to offer equal amounts of free and priced advertising time to all candidates in an election.¹¹⁰ The second rule was the 'Fairness Doctrine' which forced stations to provide 'reasonable' and unbiased discussion of public affairs. Since both rules tried to balance the role of broadcasting in public affairs, they primarily regulated news and other supposedly factual programs.¹¹¹

The Commission explicitly excluded advertising from what it considered to be selfish purposes, and maintained that advertising was necessary to pay for what it called 'public service' broadcasts. Advertising was, in fact, necessary to pay for one type of program, but certainly not all since educational, religious, and labour stations did not require it. The FRC was simply unwilling to limit most advertising. Nevertheless, members of agency found some kinds of advertising to be objectionable. In such cases, the Commission would threaten to investigate the total activities of any stations broadcasting such things as radio lotteries, and ads for

¹¹⁰ An unintended consequence of this clause was to increase the amount of money that a candidate had to raise for an election. Without any limits, candidates spent all that they could on radio advertising which became an important part of electoral politics in the 1930's. Had the FRC really wanted to neutralize the political effects of commercial broadcasting, it would have banned political advertising altogether. Instead, it allowed the broadcast media to favour the candidate who could raise the most money. Politicians were thus put under greater pressure to attract campaign donations and serve the interests of the donor.

¹¹¹ Cantor and Cantor, op. cit., p. 171; and Herring, op. cit., p. 172.

alcohol in the 1930's.¹¹² But since the 1940's, stations have argued that the 'raised eyebrow', as the practise was called, constituted censorship, and the FCC can no longer threaten stations.

The 1927 Radio Act effected what large commercial broadcasters wanted; the FRC used its authority to give them clear channels. Since the overall number of stations had to be reduced to allow for clear channels, other broadcasters lost their licenses. For example, the number of educational stations declined from 95 to 44, with 23 selling their licenses to commercial stations between 1927 and 1932.¹¹³ Many non-affiliated and non-profit stations remained, but except for a few, they broadcasted to a small area and some shared frequencies. Although some broadcasting practices were prohibited, most advertising was allowed and stations were under no obligation to broadcast any particular program.

The Radio Act per se did not have these effects; rather, it vested power in the FRC, whose members instituted the policies that benefitted commercial broadcasting. They ruled according to technical standards and placed no restrictions on advertising partly because the agency wished, above all else, to avoid being sued.¹¹⁴ Since it had few resources and needed Congress to reconfirm it each year, the FRC also avoided arousing political opposition. The larger commercial stations

¹¹² Carl J. Friedrich and Evelyn Sternberg, 'Congress and the Control of Radio Broadcasting, I', The American Political Science Review, XXXVII, 5, (October 1948), p. 803, 813.

¹¹³ Gibson, op. cit., p. 22.

¹¹⁴ Barnouw, A Tower in Babel, op. cit., p. 215.

especially intimidated the Commission since they were better able than most to enlist the aid of congressmen and pay for litigation.

The agency's ruling also stemmed from its members "great confidence in the sound judgement of the listening public as to what types of programs are in its own best interests."¹¹⁵ In other words, programs supported by advertising must have been in the public's best interests because they were the most popular broadcasts, and the Commission's role was to ensure that the public got what it wanted. Since the commercial stations were identified as representatives of the 'public', they would provide the full diversity of desired programs. The agency stated that "As a general rule... particular doctrines, creeds, and beliefs must find their way into the market of ideas by the existing public service [i.e., commercial] stations, and if they are of sufficient importance to the listening public the microphone will undoubtedly be available."¹¹⁶ Consequently, there was no need to ensure the existence of non-profit broadcasting, or to restrict the amounts and types of advertising.

The FRC's attitudes towards radio broadcasting reiterated its general assumptions about communications media. They believed radio would accommodate existing tastes without changing them. In other words, the medium was simply a conduit for messages, a neutral technology. The messages were considered independent of the medium and hence they were what required regulation. Given this supposition, the FRC argued that the audiences could choose what was in its

¹¹⁵ Herring, op. cit., p. 173.

¹¹⁶ Ibid., p.172.

best interests because listeners were presumed to know what they wanted. The possibility that listeners did not know what to expect from radio and that the medium itself might have effects on the program and audience did not suggest itself to the FRC.

Just as the medium per se was not believed to have any effects, neither was advertising expected to influence the nature or diversity of programs. Advertisers were supposed to sponsor programs according to their popularity, which was based on long-standing tastes, and not be biased towards some types of programs. This assumption proved to be false because, in the words of Bob Shanks, a former Vice-President of ABC:

Program makers are supposed to devise and produce shows that will attract mass audiences without unduly offending these audiences or too deeply moving them emotionally. Such ruffling, it is thought, will interfere with their ability to receive, recall, and respond to commercial messages. This programming reality is the unwritten, unspoken gemeinschaft among all professional members of the television fraternity.¹¹⁷

Committed to this line of thinking, commercial stations have not broadcasted all 'doctrines, creeds, and beliefs' of public significance because doing so would contradict their primary purposes - to advertise and make profits.

¹¹⁷ Bob Shanks, 'Network Television: Advertising Agencies and Sponsors', in The Commercial Connection: Advertising and the American Mass Media, ed. John W. Wright (New York: Delta, 1979) p.94.

Educational Broadcasting

Not all radio listeners were convinced that commercial broadcasting was the only worthwhile use of radio. Those educators who had lost, or were losing, their broadcasting licenses still hoped that radio could be used for their purposes. They found Congress more sympathetic after the 1932 election, and lobbied for the passage of the Hatfield-Wagner Bill in 1933. This proposed legislation was designed to increase the diversity of radio programs by giving one-quarter of stations to educational, religious, and other non-profit organizations. Although they were not to profit from radio, these stations would have been allowed to sell advertising time to support themselves. Fearing that they might lose their licenses, the commercial stations argued that the bill would actually lead to more radio advertising because non-profit stations would also be selling time.¹¹⁸ Moreover, the networks pointed out that they had ample time to sell to any organization that wished to broadcast.¹¹⁹

Although some congressmen wanted to promote non-profit broadcasting in 1933, they were preoccupied with legislation related to the depression. Consequently, the bill aroused opposition and generated little support. As a compromise, Congress referred the matter of non-profit broadcasting to the FRC. This body, which was still dominated by Hoover's appointees, stated that redistribution was unnecessary

¹¹⁸ The lobbyists for the commercial interests did not explain how they came to this conclusion.

¹¹⁹ Barnouw, The Golden Web, op. cit., pp. 23-26; and Gibson, op. cit., p. 32.

because commercial stations had sufficient time for non-profit purposes. The networks did in fact begin some educational broadcasts to fill their sustaining programs, but these were rescheduled or cancelled when it suited sponsors. Network educational programs disappeared in the 1940's when most broadcasting time became sponsored.

After being frightened by the Hatfield-Wagner Bill, commercial stations justified their possession of licenses by claiming to broadcast public affairs programs.¹²⁰ These claims were accepted without question until 1945 when Commissioner Clifford Durr reviewed the performance of stations. He found that while many stations provided adequate discussion of public issues, some broadcasted none and thus failed to honour the terms of their licenses. Durr suggested that the latter either lose their licenses or be forced to fulfil the requirement. Most commercial broadcasters reacted angrily, arguing that the review was inspired by 'socialism', 'communism', 'treachery', and 'fascism'. Even the stations approved by Durr resisted FCC scrutiny of their programs because they wanted to avoid all supervision. The Commission relented to the pressure of the industry and continued to grant television licenses to the owners of stations that had been criticized by Durr. Most of the commissioners believed that public issues should be discussed on commercial broadcasts, but only Durr and one other had the stomach for another confrontation with commercial broadcasters so soon after the conflict over network

¹²⁰ Barnouw, The Golden Web, op. cit., p. 228.

monopolies.¹²¹ This was the last occasion where the FCC argued that some types of programs should be broadcasted, and since then it has intervened only to prohibit certain practices.

Although the election of Roosevelt had little effect on the operations of commercial radio, it did act as a catalyst for the establishment of the Public Broadcasting System. As in other industries, the administration sought to augment business practices by encouraging others to do what businesses would not, such as broadcast educational programs. Since broadcasters could not be forced to meet the FCC's standards, an educational network had to be formed. The goal was to complement, not challenge, commercial broadcasting. To foster an interest among educational organizations in the possible uses of radio, the FCC asked for their opinions when it was planning new channel allocations in 1935.¹²² In 1938, the FCC allocated 25 channels in the VHF range to non-profit, educational broadcasting which was the first time channels were set aside for a particular type of broadcaster. Beginning in 1940, twenty percent of FM stations were reserved for educational broadcasting.¹²³

But the FCC gave no thought to the non-profit uses of television, and from the beginning, it allocated channels to give stations the maximum access to audiences. This method suited commercial broadcasters because stations were

¹²¹ Ibid, pp. 229-232.

¹²² Gibson, op. cit., pp. 33-35.

¹²³ Ibid, pp. 47-49.

concentrated in the larger cities, which maximized the number of viewers per station. By contrast, equal and comprehensive coverage of the nation would have been in the interests of educational television. Moreover, since no stations were reserved for educational broadcasting when television was first granted commercial authorization in 1941, commercial stations occupied the most valuable channels. In any event, the FCC allocated 242 channels to educational television in 1951 and 1952, but two-thirds of these were in the UHF range and could not yet be used.¹²⁴ Few non-profit organizations built stations in the 1950's because UHF equipment was not available and, in any case, they had no money to construct stations. Regardless, Congress stopped the FCC from transferring unoccupied educational channels to commercial use in 1956.¹²⁵

The Public Broadcasting System

Since only 62 of 273 educational stations were in use, the Kennedy administration realized that reserving channels was not sufficient and the federal government actually had to finance non-profit broadcasting. As a result, federal grants were offered to these stations, usually to purchase equipment, beginning in 1963.¹²⁶ More important, Congress passed a law at the behest of the FCC that required all television sets manufactured after 1964 be able to receive all UHF

¹²⁴ Ibid, p. 78.

¹²⁵ Ibid, p. 83.

¹²⁶ Ibid, pp. 102-104.

channels. Following the increased capacity to receive them, some stations were established to broadcast along such channels.¹²⁷ Johnson's administration gave increasing amounts to build educational stations, which led to the problem of providing programs for them. The least expensive approach was to establish a network that would allow the stations to share program production costs.

Just as in the 1920's, some means had to be implemented to pay for non-profit broadcasting. The options considered were a tax on the sale of television equipment, donations, a tax on commercial station licenses, and support from general tax revenues. Commercial stations successfully resisted the proposed tax on their licenses, and the manufacturers were able to avoid a levy on their equipment. Neither the FCC nor the legislative sponsors of PBS tried to push through either proposal and they dropped them as soon as businesses made their opposition known. The government was not able to devise a special scheme to pay for public broadcasting and thus it was financed from general revenues.¹²⁸

Although public stations had no other choice but to go along with this funding arrangement, they wanted the administration to begin a treasury trust for PBS. They asked the government to place large sums into an interest-bearing account, from which PBS would withdraw the interest to pay its operating expenses. In this way, public television would largely be insulated from government pressure because it

¹²⁷ Erik Barnouw, The Image Empire: A History of Broadcasting in the United States, Volume III - from 1953 (New York: Oxford University Press, 1970) p. 201.

¹²⁸ Gibson, op. cit., pp. 142-143.

would not have to rely on annual appropriations that might be withheld for political reasons. Since it lacked available funds owing to other commitments, the Johnson administration did not make large appropriations for the trust. The Nixon administration was vigorously opposed to a trust because it wanted to pressure PBS into providing favourable editorials about the executive.¹²⁹ Commercial networks were also intimidated but not to the extent of PBS, whose budget was sharply cut. It had to cancel several programs to avoid being dissolved altogether and not surprisingly, PBS has, to this day, remained uncertain of its future funding.

The federal government does not even pay half (although usually more than a quarter) of PBS's expenses and much of the rest comes from donations. The Ford Foundation alone gave \$286 million between 1952 and 1973 to educational and public broadcasting.¹³⁰ Although the support of some corporations is best characterized as highbrow advertising, the extent of donations to PBS contrasts sharply with the complete failure of radio stations to attract philanthropic support in the 1920's. Nevertheless, the need for donations has driven public television to develop along certain lines and not others. Prior to the formation of the network, education stations operated in two ways: the first was to broadcast to a general audience, and the second was to transmit programs to specific audiences. The purpose of the former was to provide 'higher quality' entertainment as an alternative to commercial television, whereas the latter subordinated the use of television to the

¹²⁹ Ibid, p. 203.

¹³⁰ Ibid, p. 206.

needs of education. Since PBS stations have to solicit donations, they must draw a sizeable audience that is willing to support them financially. Consequently, PBS stations cannot direct their programs at small groups, such as school classes, but must address a wider audience.

3. Business, Government, and Television

This discussion of the relationship between the large radio companies and government has thus far centred on the ability of the former to take advantage of favourable public policies and resist government controls. But the relationship goes further than this. Once the companies had become established, they were able to strongly influence the formation of public policies by working within the government. From this position, they were able to defend their economic interests and mold television to suit their purposes. Their ability to do this stemmed from the peculiar workings of American politics abetted by the way members of the government thought about communications technologies.

Congress

Although the FCC was the main government body concerned with broadcasting, it was clearly not independent of the other branches of government. Congress has the official authority to change the laws governing the FCC, which also gives it considerable informal power to pressure the agency. Moreover, although

nominated by the President, the chairman and all the members of the commission must be confirmed by the Senate, and the agency's budget is allocated by the House of Representatives. These mandates give Congress potentially great power over the agency.

When paired with the efforts of congressmen to be re-elected, this power has made Congress the main mechanism through which private groups have influenced the regulation of broadcasting. Congressmen often spoke before the FCC to explain the 'peculiarities of local situations' on behalf of some constituents. Although non-profit groups have occasionally had congressional support, business interests have been more successful because they have been better able to provide incentives. Commercial stations and networks have made campaign contributions, bribes, and provided radio time to accommodating politicians.¹³¹ In turn, these politicians have exerted pressure on the Commission through the various means at their disposal. Despite having greater resources to reward politicians with, businesses do not always get the preponderance of congressional support. For example, many congressmen, such as Warren Magnusson and Jacob Javits, assisted PBS for no material gain, although not to the point of challenging commercial interests and incurring opposition.

¹³¹ In the past, congressmen were given easy access to radio time, e.g., Senators spoke 700 times and Representatives 500 times on CBS between 1929 and 1940. Friedrich and Sternberg, op. cit., p. 808.

The Executive and the Commissions

Although it has seldom tried to guide the FCC in any particular decision, the executive has usually set the tenor of the agency by nominating ideologically suitable individuals for membership. Nevertheless, no President has sponsored a broadcasting policy, and has left the Commission to translate general guidelines into specific broadcasting policies. This process is also subject to the influence of Congress and the unique pressures acting on the agency. For example, networks and manufacturers could offer executive positions to retired agency officials, as NBC did to Charles Denny in 1947.¹³² While it cannot be proven that jobs were traded for rulings, the prospects of an executive career in business would have led officials to try to remain on friendly terms with certain companies.

The power of manufacturers and broadcasters was not limited to their ability to influence and co-opt individual members. The commercial interests were also an essential part of the way the FCC set technical standards, which allowed them to determine technical characteristics of the medium. For example, picture quality, transmitting frequencies, and the type of colour system were all variable features. Not only did these determine what the technology could do, but also the division of power in television broadcasting and manufacturing.

Between 1934 and 1948, twenty-four individuals served as members of the FCC; fifteen of them were lawyers, four engineers, two journalists, one educator, one

¹³² See Chapter 2, page 52.

banker, and one businessman.¹³³ Despite their general lack of expertise, these commissioners were expected to form opinions and rule on technical matters. Members could ask the agency's staff for advice, but the staff was not always knowledgeable either. As television was being improved in the 1930's, only a few companies were experimenting with it and had a firm grasp of the implications of the technical options. Partly because of its own incompetence, and partly to systematize its relationship with the industry, the FCC organized a series of industry groups to investigate and make recommendations on technical matters. The agency left such concerns as wavelength allocations and the technical standards of television to the Radio Manufacturers Association. Although the agency could reject any recommendation, as it did repeatedly in the case of television standards, it could not implement technical policy that had not first been sponsored by part of the radio industry. Moreover, no one outside the industry was consulted, even if others were competent.¹³⁴

There is clear evidence that corporate strategies within the RMA determined standards more than technical considerations did. All companies recommended standards that, on the one hand, they thought the public would accept, and on the other, gave them an advantage over their competitors. For example, in 1947, CBS argued that the FCC should not accept pre-war monochromatic television, but should wait a year for the colour system that it was developing for two reasons. First, it

¹³³ Stern, op. cit., p. 361.

¹³⁴ Ibid., pp. 137-248.

wanted to benefit from the manufacture of television by holding an essential patent and secondly, it wanted to force television out of the VHF range, where its competitors had licensed stations in the largest markets. RCA, Farnsworth, and most of the other manufacturers opposed CBS because they did not want commercial authorization to be delayed, or CBS to hold a key patent. Although CBS's engineers claimed that its colour system would be ready within a year, RCA's engineers said it would take CBS three years, by which time RCA could have produced a colour system compatible with monochromatic television.¹³⁵ In such cases, the FCC agreed to the recommendation that seemed to offer the speediest domestication of television. But when this was not clear, it ruled on the side that most of the industry seemed to support and hoped for the best.

This method of ruling had the political advantages of guaranteeing that the agency had an ally and directing much of the conflict away from the FCC. It failed, however, when corporate engineers did not take all technical possibilities into account, which happened when the frequency band was apportioned into channels and stations. In 1945, the FCC began to plan the national coverage of television and it had to decide where to put stations. The Commission's engineers believed that to avoid interference stations using the same channel had to be 200 miles apart and stations using adjacent channels had to be at least 85 miles apart. This apportionment plan allowed for few stations along the Atlantic coast, such as four

¹³⁵ Barnouw, The Golden Web, op. cit., p. 243.

for New York City.¹³⁶

Commercial interests, hoping for more stations in the lucrative Eastern markets, argued that co-channel stations could be 150 miles apart and adjacent-channel stations could be 75. The FCC redistributed stations according to the industry's assessment of interference which allowed for seven stations in New York. But by the time a hundred stations were broadcasting, interference had become common because co-channel stations were not far enough apart. The agency had to stop licensing stations from 1948 until 1952 when a new, more realistic, apportionment plan had been devised. Meanwhile, many areas, including some large cities, had no television station at all.¹³⁷

No one company was always able to get what it wanted from the FCC, and this method of ruling did seem to be effective at balancing competing business interests. But what was lost in this apparent evenhandedness was any discussion on matters that the members of the RMA unanimously agreed upon. For example, the RMA agreed that television stations should be distributed to give stations access to the largest audience. Consequently, the number of stations in an area was partly determined by the number of inhabitants, i.e., the number of consumers. The FCC never considered apportioning stations to provide all Americans with equal television service, because no RMA member suggested it. As a result, stations were distributed to serve the interests of advertisers and not audiences.

¹³⁶ Stern, op. cit., pp. 273-277.

¹³⁷ Ibid., pp. 297-300; and Barnouw, The Golden Web, op. cit., p. 285.

Conclusions

V

I. Overview

As we have seen, electronics manufacturers designed and implemented television to extend radio broadcasting, and profit from the sales of sets to viewers and station time to advertisers. The executives of these companies employed the medium in the way that promised the highest profits, without considering the desirability of its effects. They effectively justified their investments by claiming that television would be a benefit to all. Since it would allow its viewers to witness what they pleased, the executives asserted that television would contribute to the formation of an ideal society. For example, citizens would become better informed,

enlightened, and civilized within the open and democratic communities fostered by electronic media. They would no longer suffer from war or ignorance, and everyone would be provided with access to the knowledge they needed to prosper. Most of those interested in the medium during its development accepted this view of things as a sober and responsible assessment of the technology and they repeated the executive's pronouncements. As a result, there was no public debate about whether the medium's effects were acceptable. The profit-motivated decision to extend radio broadcasting in this way was expected to produce universally positive results.

All this notwithstanding, television could have been organized to achieve different goals depending on the arrangement of some mutable design features. But these features continued to be established to boost the profits of broadcasting companies, owing to their power to influence the American government. The interplay between large corporations and the government shaped the three components of the technology: the apparatus itself, the skills and procedures involved in operating the apparatus, and the organizations that structure this activity.

At the organizational level, government policy was responsible for forming RCA in order to monopolize radio manufacturing and transmitting. Other radio companies were at a disadvantage and successfully lobbied government bodies to loosen RCA's control of manufacturing. But RCA's predominance in broadcasting was only slightly weakened and this was achieved by allowing two other companies to share in its control. Throughout the 1930's and 1940's, the networks and large commercial stations successfully resisted any effective regulation of the ownership

of radio stations. Moreover, the same stations were given control of television broadcasting because the speedy domestication of the medium was paramount to FCC, regardless of how it was to be employed.

Government policies were also instrumental in establishing both commercial and non-profit, public broadcasting. Radio manufacturers were the first broadcasters because they hoped to sell receiver sets. Since directly paying for programs lowered their profits, the manufacturers looked for other ways of financing their stations. But Herbert Hoover's influence in government effectively ruled out any means of paying for broadcasting other than by advertising. Hoover neither imposed a scheme nor forced the manufacturers to agree on one because he believed that a government should limit itself to facilitating private actions. Obtaining support from advertisers (and becoming profit-oriented) was the only way that stations could offset their costs without government interference, and this means of financing became common.

Commercial broadcasters, who no longer wanted to share frequencies, urged Hoover to directly regulate radio and reduce the number of stations. The 1927 Radio Act gave this authority to a federal commission. The Commission was sensitive to criticism, especially that of companies, because it lacked clear goals, resources, and political support. Consequently the agency reduced the number of non-profit stations and increased the time and coverage of commercial broadcasters. Under Franklin Roosevelt, members of the administration tried to change the practices of commercial stations but failed because the latter could muster overwhelming support in Congress. Those favouring non-profit broadcasting had to be content with

building, with government help, a network around the fringes of commercial broadcasting, and commercial stations were largely left alone.

These commercial interests not only resisted outside control over their organizations and programs, but also established the characteristics of the medium itself. By virtue of being incorporated into the government bodies that decided such issues, they were able to shape television to suit their purposes. For example, American television has 525 horizontal picture lines because this arrangement allowed the three largest radio networks to have national coverage for their television broadcasts. By contrast, European television has superior picture definition because, with a state monopoly of broadcasting, only one or two networks needed to be accommodated in the radio-wave spectrum, which allowed each network to occupy a wider band width. Commercial stations also influenced the FCC to allocate stations in a way that gave stations access to the largest audience, rather than providing individuals access to equal television service.

II. Ideology of Technology

Despite the consistent optimism about the medium's effects before it was domesticated, television is now more often criticized than praised by those interested in it. Discussions of its role in more open and accessible communities have been replaced by complaints about the 'boob tube', or 'idiot box'. Television is seen to

have failed to live up to its potential to educate, inform, and entertain. Given its development, however, this failure is not surprising and television does live up to the goal it was designed to achieve - to earn profits for manufacturers and broadcasters. Whether it informs and amuses or not is secondary to the profits it generates.

The commercialization of television and broadcasting was certainly facilitated by the functioning of American politics. Despite claiming to be neutral, the decision-making processes of government were influenced by money. Affluent corporations and conglomerates were thus best able to shape government policies. But this is not a complete explanation of why television was not shaped to serve some public goal, i.e., some purpose beyond producing profits. The United States' government has effectively regulated some industries, at least temporarily, e.g., the Roosevelt administration decentralized the ownership of utilities by prohibiting holding companies from owning them. By contrast, the prevailing attitudes of those in government towards television allowed private interests to take charge of media development, deployment, and financing.

Television, like radio before it, was considered to be a neutral tool, i.e., it was simply an improved means to communicate. It was thought to be a conduit for information and entertainment that would expose its audience to a wider variety of experiences, which did not differ significantly from those offered by other media. In other words, the medium would not influence what was communicated through it, and could thus be used for beneficial or harmful purposes. The only possible negative effects would result from particular programs and could be regulated after

the medium was domesticated.

But like the telephone, television has had inherent and unforeseen effects. While there is no consensus among researchers on just what the medium has done, almost all have argued that its domestication has had significant consequences. For example, Joshua Meyrowitz and Neil Postman independently have argued that television has helped erode the differences between children and adults.¹³⁸ Meyrowitz suggests that "each step in the socialization process from childhood to adulthood involves exposure to some new information and continued restriction from other social information".¹³⁹ In the case of literacy, this exposure comes gradually as an individual's reading skills improve. Television undercuts this process because it presents information in a form that most can understand. Consequently, children have access to much the same information as adults, and the differences between the two are eroded. Some early commentators asserted that television would allow everyone to become better informed, but they did not anticipate that the medium would change the meaning of being 'informed'. There was not attempt to predict and control such outcomes since the medium was a neutral 'tool', and not a device that was predisposed to produce certain effects.

Moreover, the unstated purpose of the medium, to advertise, was also envisioned as exerting little influence on the technology or its products. Since media

¹³⁸ Joshua Meyrowitz, No Sense of Place: The Impact of Electronic Media on Social Behavior, (New York: Oxford University Press, 1985); Neil Postman, The Disappearance of Childhood, (New York: Laurel, 1982).

¹³⁹ Meyrowitz, op. cit., p.235.

were not believed to affect what passed through them, audiences would want from television what they also desired from radio, newspapers and other media. Consequently, advertisers were expected to direct programs at existing tastes and would not themselves determine what the public would expect from the new medium. In other words, since audiences knew what they wanted, to be commercially successful, stations would have to provide it. This type of argument was accepted by the proponents of PBS who criticized commercial stations for aiming their programs at the 'lowest common denominator', and not because, as the industry has affirmed, programs are designed to draw attention to, and not from, advertisements.

Since it was assumed that the positive or negative effects of television depended on particular programs, there was, it followed, no need to impose controls before the technology was domesticated. Any ill effects could be remedied later. But this hope has proven to be false, e.g., in a study on the effects that the mass media have on violence commissioned by the Solicitor General of Canada, the authors conclude that "realistically, producers of mass media are an influential lobby and it is unlikely, quite aside from whether it is desirable, that violence be banned from content packages".¹⁴⁰ They go on to suggest that tax incentives be offered to stations that do not broadcast violent programs, and that the government should counteract the influence of the mass media with an educational program. The political power of the companies that benefit from commercial television is a strong

¹⁴⁰ Brenda J. Heald and J. Stephen Warmith, Aggression as a Behavioural Response to Violent Portrayals in the Mass Media, (Ottawa: Queen's Printer, 1986) p. 95.

obstacle to changing programs.

Another hope is that television will achieve its promise through continued technical improvement. For example:

according to the predictions of various cable enthusiasts, commercial television broadcasting would now have to yield ground to cable "narrowcasting" in which an extraordinary diversity of cultural services, entertainment, and information would be made available to subscribers - such bounty showering down via satellite relay from what one television trade publication called a 'cornucopia in the sky'.¹⁴¹

Cable certainly is more likely to provide greater program diversity than network television because cables can carry many more channels than radio waves.

Nevertheless, this possibility for greater diversity has:

been countered not only by increased concentration in the cable industry, but also by the concentration arising out of conventional TV marketing practices - hustling for the biggest audience at the most efficient cost to advertisers and letting other potential audiences get lost in the shuffle. It is this cost-per-thousand notion of marketing efficiency, rather than the mere availability of a multitude of channels, that remains the supreme consideration in commercial television.¹⁴²

In other words, cable television increasingly resembles commercial broadcast television because it is being put to the same use - to earn profits from the sale of advertising time. A technology's operations are determined by the organizations controlling it and their procedures as well as its technical characteristics.

¹⁴¹ Thomas Whiteside, 'Cable-III', The New Yorker, 61, 5, (June 3, 1985) p. 82.

¹⁴² Ibid, p.105.

As we have seen, American television was largely shaped, although not always deliberately, by corporations and their relationships with the American government. The medium embodies these companies' overriding concern for profits, the influence of money in politics, ideologies of government and technology, and the reaction of some to the medium's commercialization. Consequently, one cannot speak of television's effects in isolation from those forces or tendencies that were responsible for its development. If stations are criticized for airing violent programs, then the companies that own them and the politics that allow them to broadcast what they please are also implicated. Any significant change in television can only be effected by acting on those forces that shaped it.

List of Abbreviations

ABC - the American Broadcasting Company.

AT&T - the American Telephone and Telegraph Company.

BBC - the British Broadcasting Corporation.

CBS - the Columbia Broadcasting System.

FCC - the Federal Communications Commission.

FRC - the Federal Radio Commission.

FTC - the Federal Trade Commission.

GE - the General Electric Company.

KTBC - the Austin, Texas radio station that was owned by Mrs. Lyndon B. Johnson.

NBC - the National Broadcasting Company, a subsidiary of RCA.

PBS - the Public Broadcasting System.

RCA - the Radio Corporation of America.

RMA - the Radio Manufacturers Association.

UHF - the Ultra High Frequency range of the radio wave spectrum.

VHF - the Very High Frequency range of the radio wave spectrum.

WEAF - the New York City radio station that was sold by AT&T to
RCA in 1926.

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